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MINING—1953

84TH Annual Survey And Outlook Number

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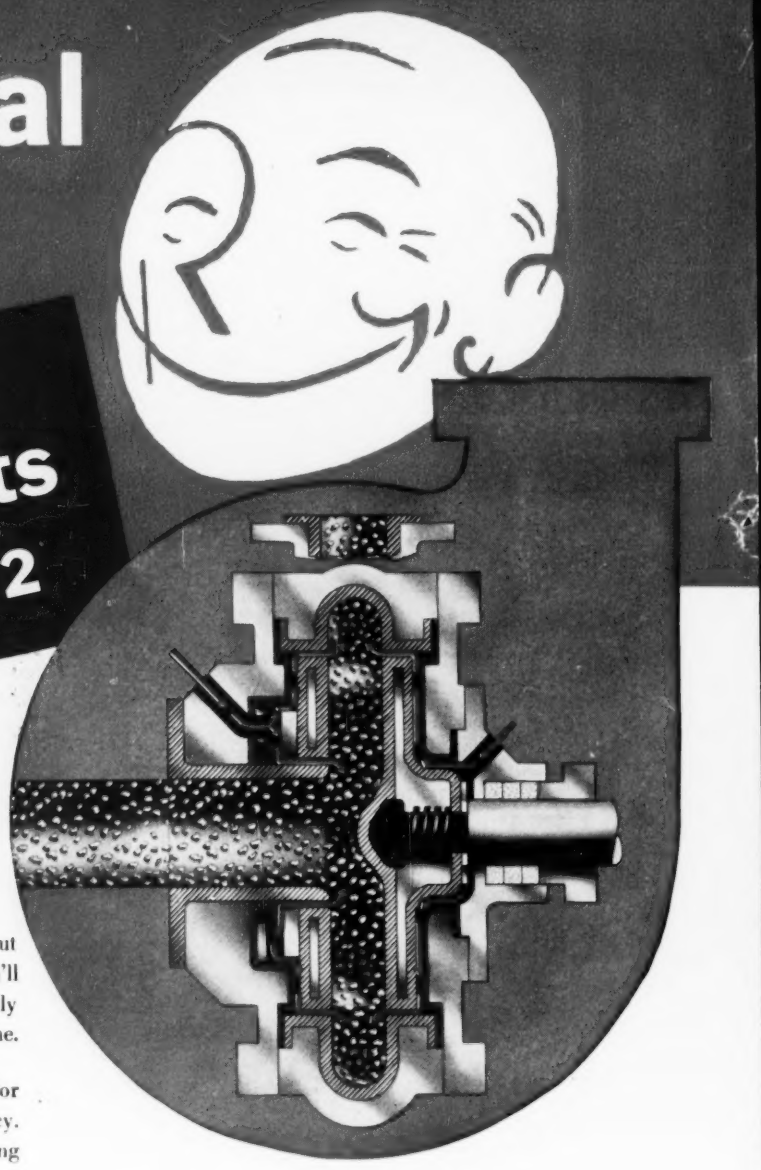
Hydroseal pumps

reduce power costs by 1/3 to 1/2



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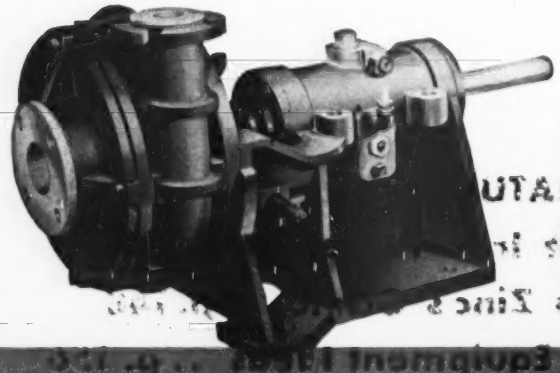

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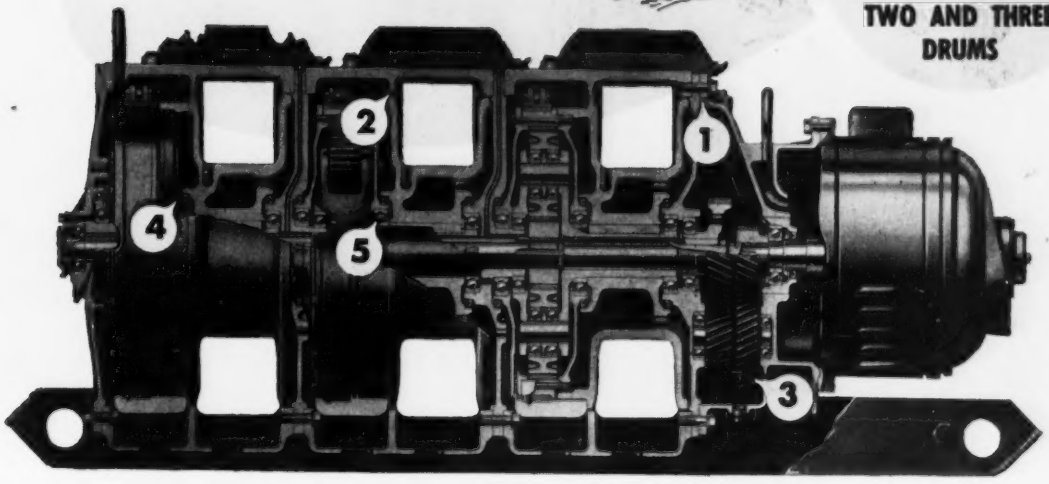

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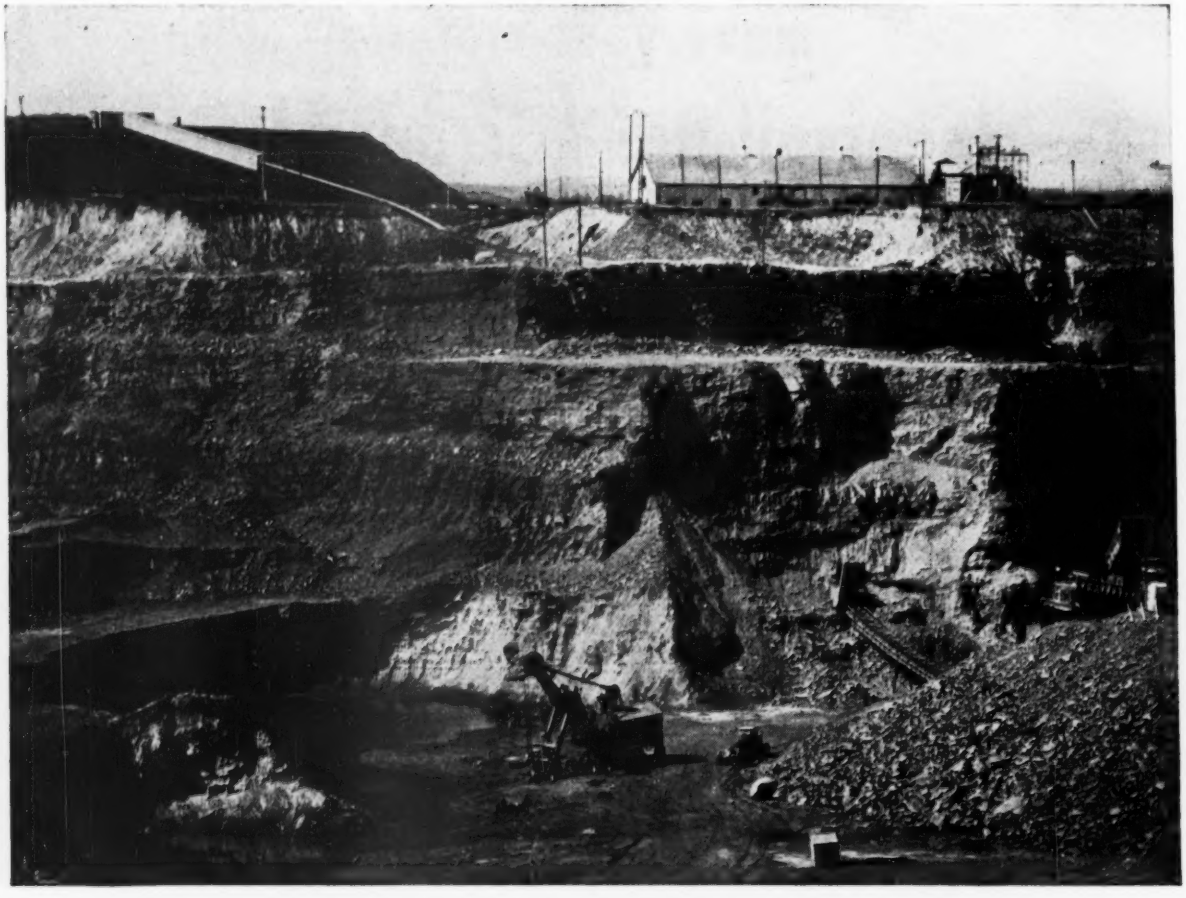

B. F. Goodrich steel cord belt rushes iron ore through a mountain

Belt for longer, higher, single-flight conveyors

UP THAT steep grade, through a mountainside, to a height of 17 stories, go *1,000 tons* of iron ore *every hour* — 24 hours a day. It's a B. F. Goodrich steel cord conveyor belt this heavy ore is rough-riding — a belt especially designed for the efficient handling of material under the severest conditions. Here's why B. F. Goodrich steel cord belt construction can make conveyor systems of lengths and lifts far exceeding anything formerly possible:

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RUBBER FOR INDUSTRY

ENGINEERING AND MINING JOURNAL

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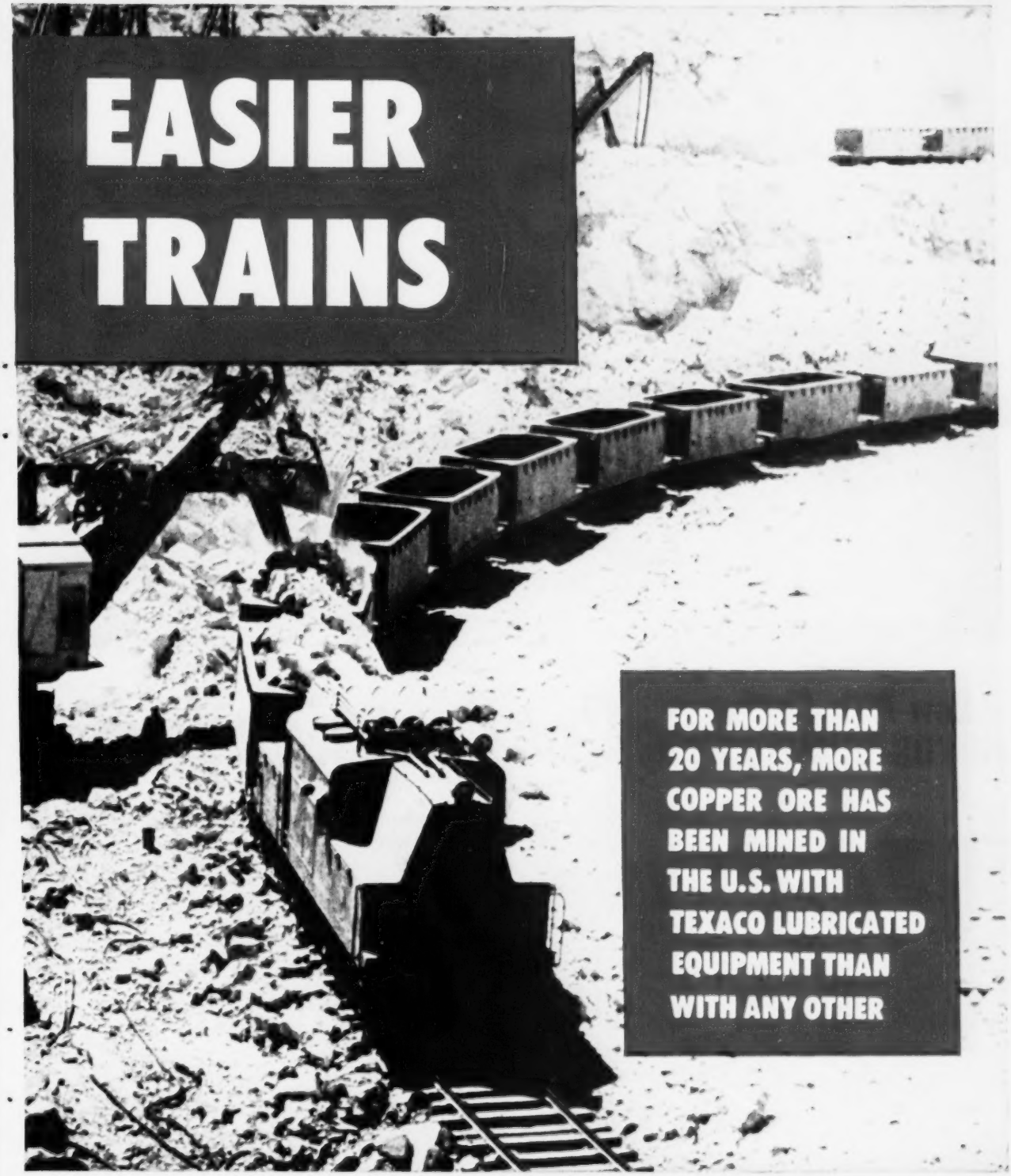

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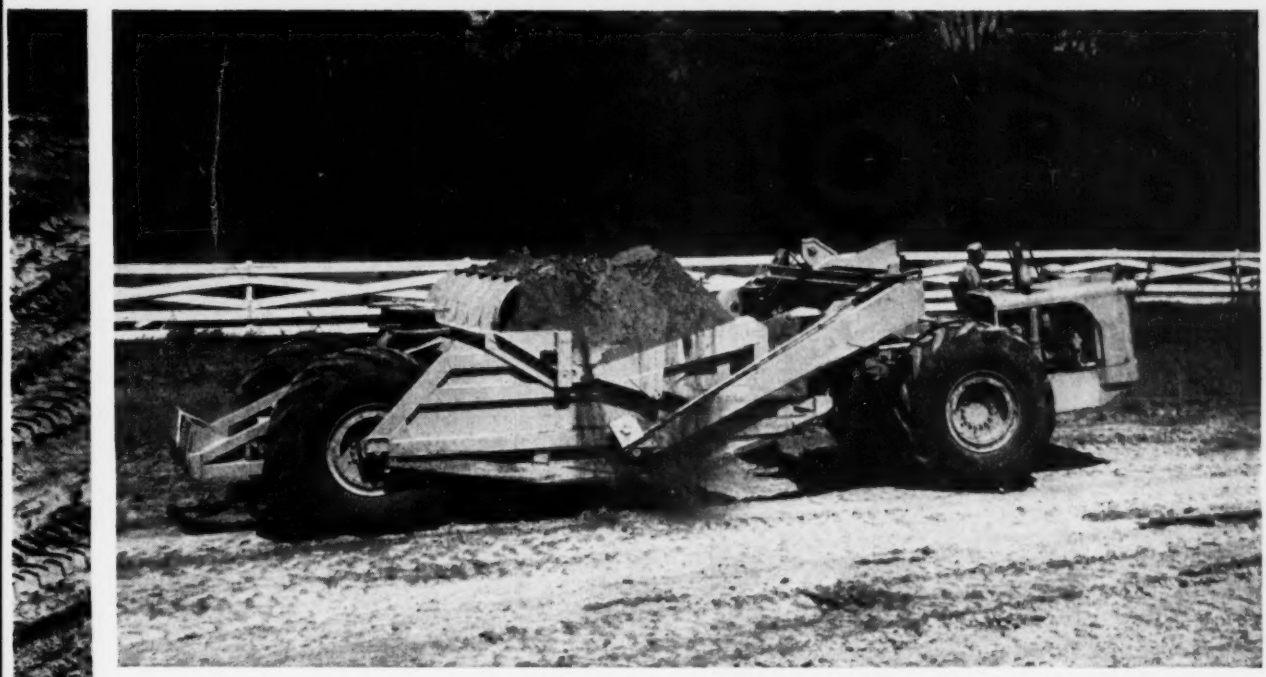

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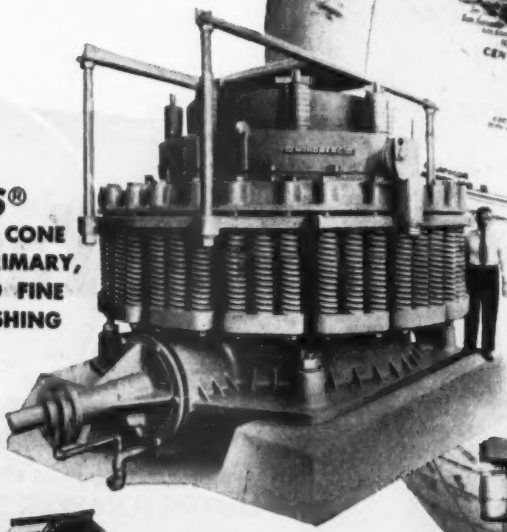

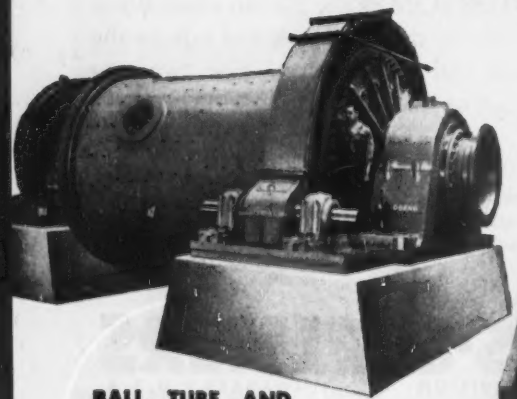

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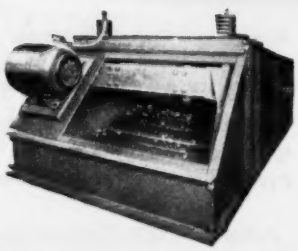

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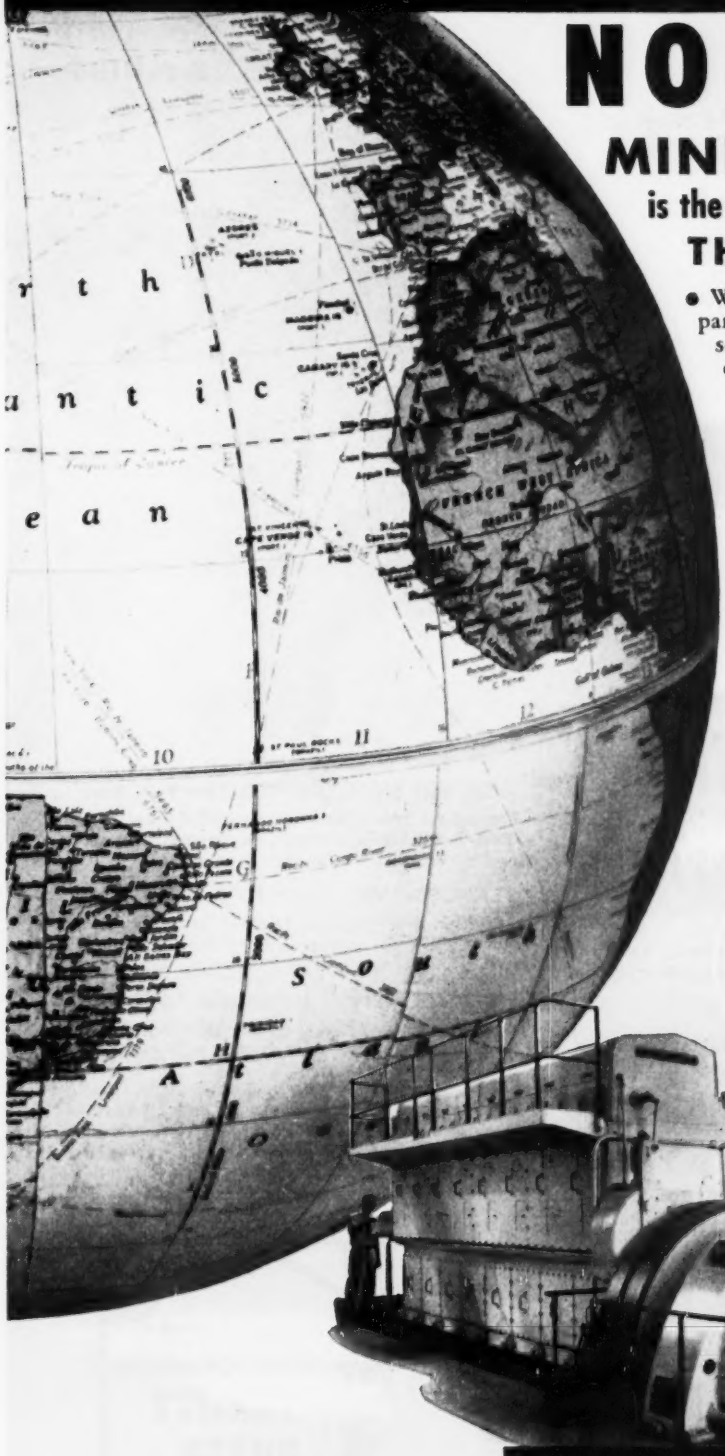

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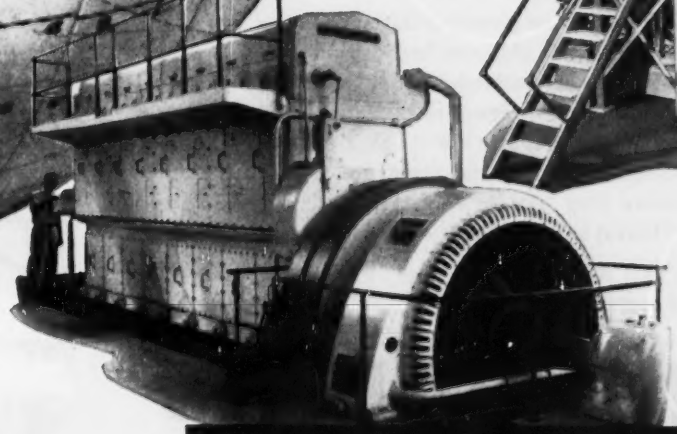

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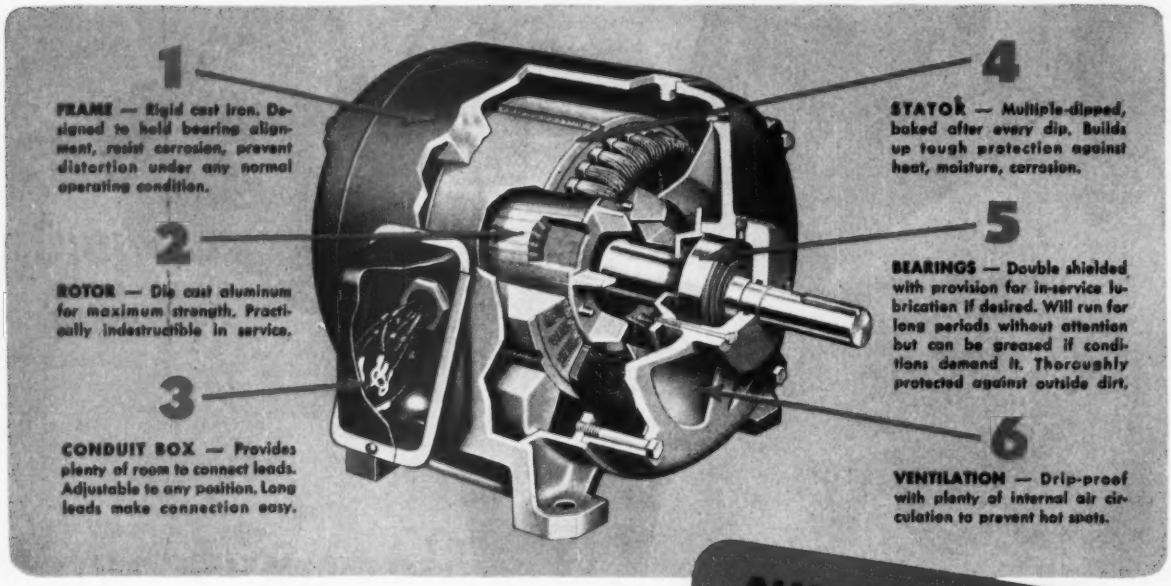
Look for These 6 Signs of Good Motor Design


1
FRAME — Rigid cast iron. Designed to hold bearing alignment, resist corrosion, prevent distortion under any normal operating condition.
2
ROTOR — Die cast aluminum for maximum strength. Practically indestructible in service.
3
CONDUIT BOX — Provides plenty of room to connect leads. Adjustable to any position. Long leads make connection easy.
4
STATOR — Multiple-dipped, baked after every dip. Builds up tough protection against heat, moisture, corrosion.
5
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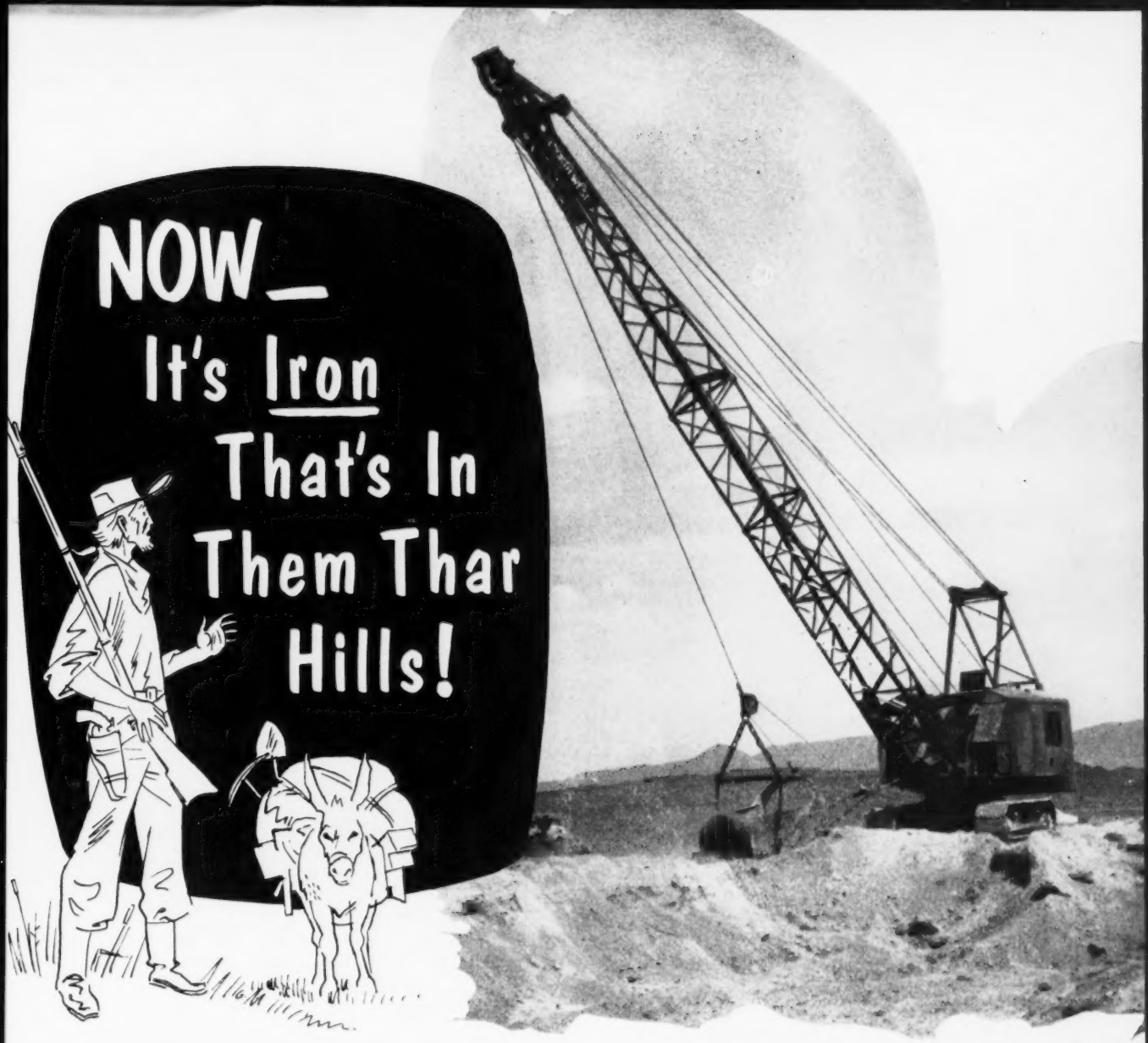

Doesn't look much like a mine now, does it? But it is! Here is another new Northwest owned by A. H. Famularo of Santa Ana, Calif., stripping overburden from deposits near Lovelock, Nevada for the Mineral Materials Co.

Northwest speed is outproducing larger, slower equipment. Northwest simplicity of design and general dependability eliminates the constant irritations and delays caused by minor adjustments. Northwest steering and generally greater ease of maneuverability smooths out the travel problems always present in stripping and assures easier travel on floors and benches.

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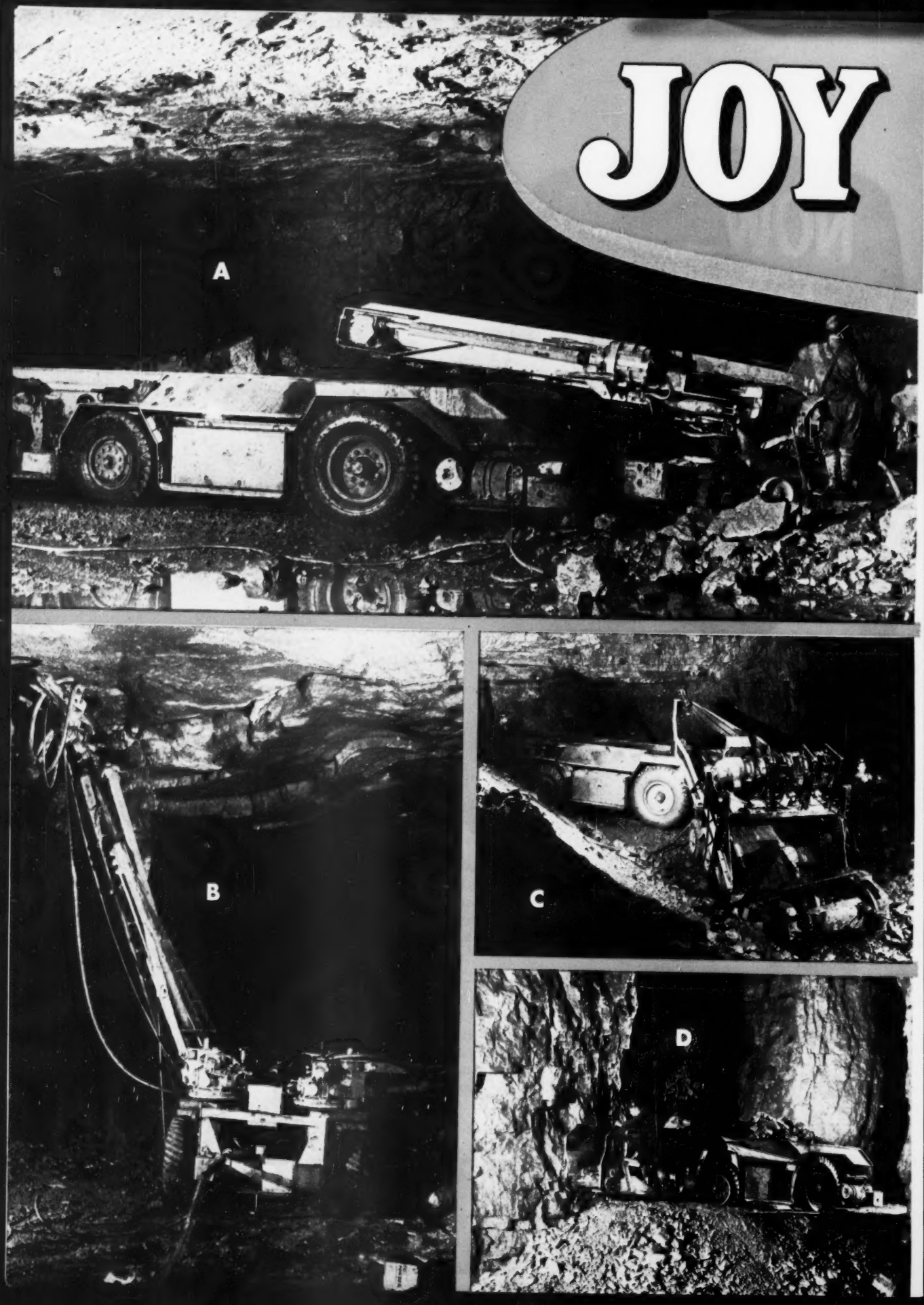
JOY
A
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MECHANIZED EQUIPMENT

reduces costs—increases tonnage

. . . does the DRILLING, LOADING and HAULING JOBS with TOP EFFICIENCY

JOY DRILLMOBILES

In photograph B on the facing page, the long reach of a JOY Drillmobile is being utilized in taking down back. These rubber-tired, self-propelled, twin-boom units are setting new standards of fast, low-cost drilling in modern trackless mining, both in the metal and non-metallic fields. JOY Drillmobiles are fast-tramming, highly maneuverable machines, available in three sizes for work in any size heading or in stopes where the grade is not too steep. Drills can be equipped with long feed or standard drifter cradles and are mounted on JOY Hydro Drill Jibs, which make hole-positioning easy and accurate, and permit remote control for maximum safety. ● *Write for Bulletin 87-F.*

JOY 18-HR-2 LOADERS

Photograph A at the top of the page at left shows a JOY high capacity, continuous-type Hard Rock Loader in operation, loading into a JOY Shuttle Car in one of the mines of the Southeast Missouri Lead Belt. This heavy-duty, crawler-mounted machine loads up to 12 tons per minute, producing high tonnage at low cost in trackless mining. It is ruggedly built to handle hard and abrasive rock and ores. The JOY gathering mechanism (not shown in the picture) assures top efficiency, and the chain conveyor swings 45° to either side of center to meet various loading requirements. A smaller model, the JOY 17-HR Loader, is built for use in more restricted areas. ● *Write for Bulletin J-108.*

JOY SHUTTLE CARS

The versatility and flexibility of JOY Shuttle Cars in metal and non-metallic trackless mines is well illustrated by the photographs on the opposite page. In photos A and C, JOY Model 60 Shuttle Cars are shown being loaded by a JOY Hard Rock Loader and a scraper, respectively; and in photograph D, a car is shown making fill. JOY Model 60 Shuttle Cars (up to 14 tons capacity) are designed to give you rapid and low-cost transferring of rock and ore from loading points to main haulage systems. They are ruggedly-built, fast-tramming cars, with conveyor bottoms to speed loading and unloading and are available with hydraulic cable reel, trolley or diesel drive to suit operating conditions. ● *Write for Bulletin J-200.*

JOY SLUSHERS

In photograph C on the facing page, a JOY electric motor-operated three-drum Slusher is shown mounted over a scraper ramp, which in turn is mounted on a JOY Drillmobile chassis for easy maneuverability in a Southeast Missouri mine. JOY Slushers are available in a full range of two and three-drum models, including air or electric-powered types, adaptable for automatic or remote control if desired and built for heavy duty with low maintenance. Allied JOY equipment includes a complete line of air, electric or gasoline engine-powered single-drum Hoists, Air Motors and Winches, Carpullers and Ropepullers, Sheave Blocks and Scrapers. ● *Write for Bulletin 76-Y on JOY Slushers and Bulletin 76-X on JOY Hoists.*

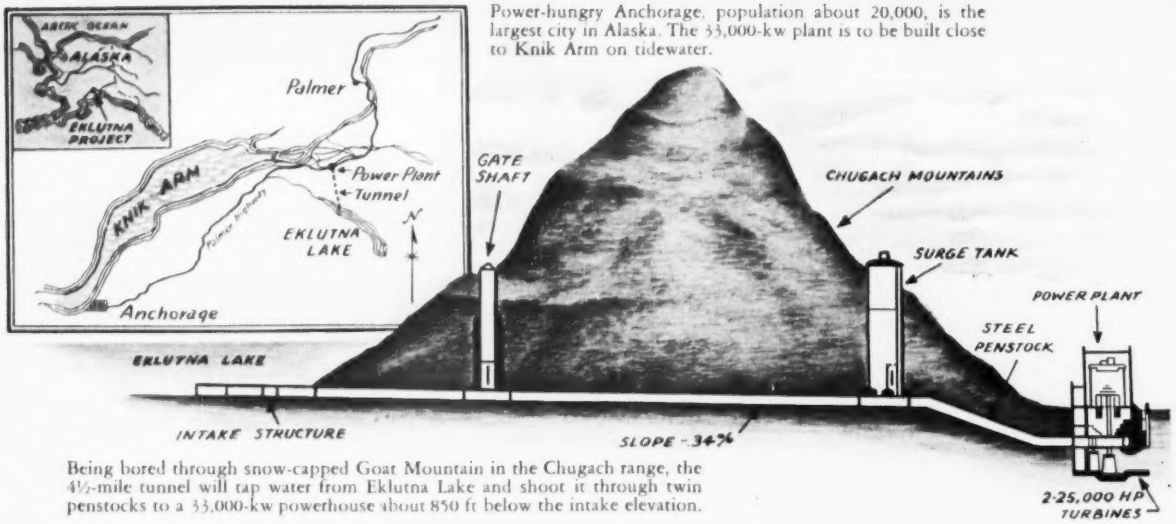
Consult a Joy Engineer

W&D M3303

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO



Power-hungry Anchorage, population about 20,000, is the largest city in Alaska. The 33,000-kw plant is to be built close to Knik Arm on tidewater.

Being bored through snow-capped Goat Mountain in the Chugach range, the 4½-mile tunnel will tap water from Eklutna Lake and shoot it through twin penstocks to a 33,000-kw powerhouse about 850 ft below the intake elevation.

Driving 4½-Mile Eklutna Tunnel for first big power project in Alaska

Late in 1951 construction got under way on Eklutna Tunnel, principal feature of a project which will harness water from a glacier-fed lake to generate electric power for the Anchorage area.

When the horseshoe-shaped tunnel has been bored 4½ miles through rock, its diameter of 11 ft will be concrete-lined to form a 9-ft conduit. Other phases of the $17,350,000 contract call for a surge tank, 1,390 ft of penstock tunnel, and alterations to a regulating dam at the outlet of the lake. The underwater intake of the tunnel will permit full operation when 60-below weather caps Eklutna Lake with thick ice.

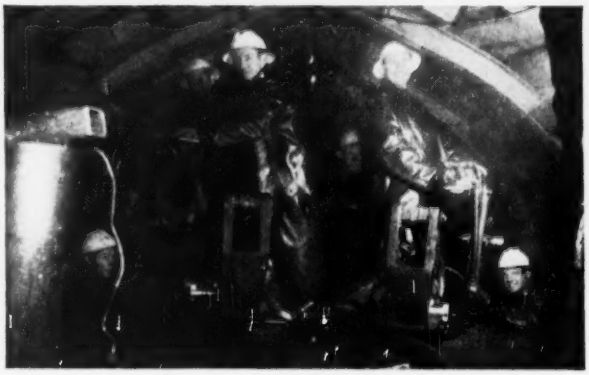
Despite an excessive flow of subterranean water, the drilling and mucking crews have averaged a daily advance of about 20 ft from the downstream end. Rock is of a broken sedimentary type, mostly graywacke with quartz and calcite stringers. Like so many hard-rock men, the contractors are relying exclusively on Bethlehem hollow drill steel.

Due for completion in August, 1954, the contract is a joint venture of Peter Kiewit Sons, Coker Construction Co., and Morrison-Knudsen Co. The three firms are organized as Palmer Constructors for this U. S. Bureau of Reclamation project.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

Main access for drilling is through an adit near the surge tank at the outlet of the horseshoe tunnel being excavated to an 11-ft diam. The jumbo mounts four drifters equipped with rods of Bethlehem hollow drill steel.



Eklutna Tunnel will be 4,500 ft below ground at its deepest point. Each round is drilled with 28 holes of 4- to 5-ft depth. Progress has been hampered by excessive water and broken rock; note steel support ribs.

BETHLEHEM STEEL

BETHLEHEM HOLLOW DRILL STEEL

"CUSHIONED" against wear

Reason Why Redwing-H Air Hose Gives Top Heavy-Duty Performance on the Job

You can depend on REDWING-H Cord Air Hose for longest, trouble-free service – even in the roughest kind of going in mines, quarries and construction operations.

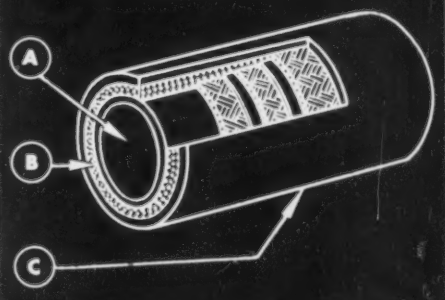
Reason is that this hose was developed by the G.T.M.—Goodyear Technical Man—to take hard knocks. Its cover—bright red in color—is resilient, tough stock that bounces away digs, cuts and abrasion. Under this super-strong cushion are multi-braids of high-strength rayon reinforcement—and a seamless, oil-resistant tube. Everything about REDWING-H adds up to longer, better service.

Ask the G.T.M. or your Goodyear Distributor about REDWING-H Cord Air Hose for your toughest jobs—available in continuous lengths, sizes from ½" to 1½" i.d. for working pressures from 200 to 350 lbs. psi. Write Goodyear, Mechanical Goods Division, Akron 16, Ohio.

GOODYEAR INDUSTRIAL RUBBER PRODUCTS

GTM-Specified

REDWING-H CORD AIR HOSE



A Synthetic tube is seamless, non-porous, non-flaking, oil-resistant

B Two or three braids of high-strength rayon reinforce against shock blows

C Red cover of heavy, resilient stock bounces away abrasion, cuts, gouges

Redwing–T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

YOUR GOODYEAR DISTRIBUTOR *can quickly supply you with Hose, Flat Belts, V-Belts, Packing, Tank Lining, Rubber-Covered Rolls. Look for him in the yellow pages of your Telephone Directory under "Rubber Products" or "Rubber Goods."*

GOODYEAR

THE GREATEST NAME IN RUBBER

We think you'll like "THE GREATEST STORY EVER TOLD"—every Sunday—ABC Radio Network—THE GOODYEAR TELEVISION PLAYHOUSE—every other Sunday—NBC TV Network

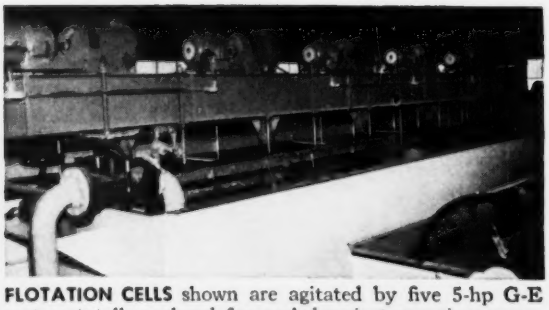
ENGINEERING REPORTS:

AUTOMATIC MINE HOIST at Duval—amplidyne-controlled and driven by a 600-hp G-E MDP motor—hoists 6 tons of ore up 1628 feet in 103 seconds. Maximum speed is 1100 fpm. Loading, acceleration, deceleration and dumping are all automatic.

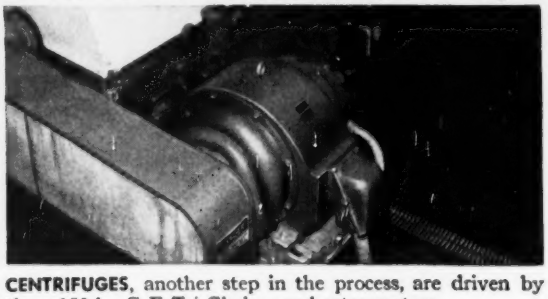
Co-ordinated electric equipment

ROD MILL inside refinery is driven at 19 rpm by a 720-rpm G-E Tri-Clad* synchronous motor rated 250 hp, 440 volts.

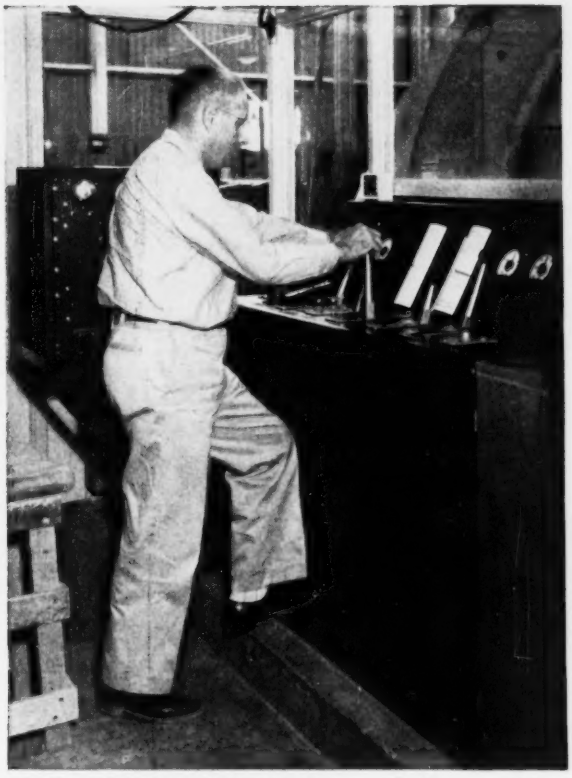
*Registered Trade-mark of General Electric Company.



FLOTATION CELLS shown are agitated by five 5-hp G-E motors, totally enclosed, fan-cooled against corrosive vapors.

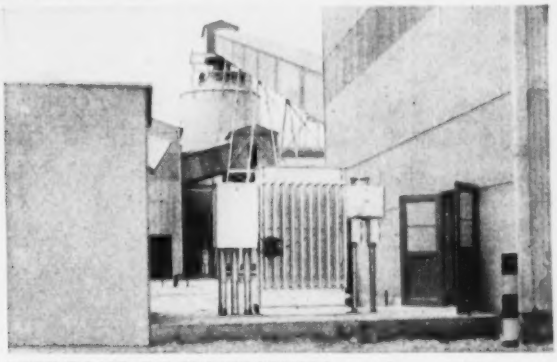


CENTRIFUGES, another step in the process, are driven by these 150-hp G-E Tri-Clad wound-rotor motors.



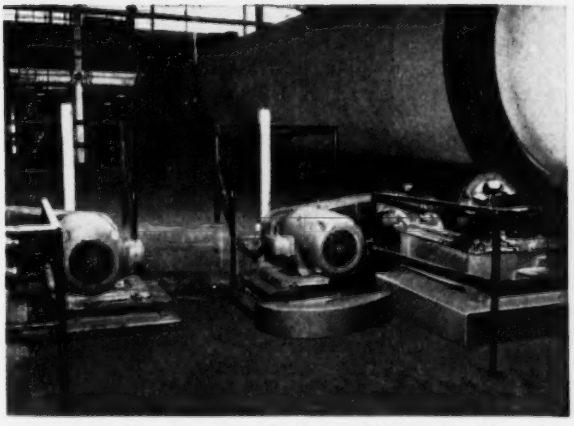
CONTROL OF MAIN ORE HOIST can also be manual by means of master control located in this hoist console.

POWER purchased by Duval is stepped down from 67,000 to 4160 volts at this G-E 5000-kva master unit substation.



DEPENDABLE G-E TRANSFORMERS step down 4160 volts to 480/277 volts grounded-neutral at 6 utilization areas.

keeps Duval potash output high



DRYING KILNS, where the refined potash is prepared for shipment, are driven by 40-hp G-E totally enclosed motors.

System engineered for efficient operation of automatic hoist and refinery drives

Typical of the way General Electric helps mining companies handle high tonnages at low cost is the new potash mine and refinery of the Duval Sulphur and Potash Company at Carlsbad, N. M. General Electric supplied power transformation equipment, refinery motors, and mine-hoist electric equipment.

G-E engineers—working closely with engineers of Duval Sulphur and Potash Co. and their engineering contractors, Stearns-Roger Mfg. Co.—applied this co-ordinated drive equipment to meet Duval's needs most efficiently and economically.

To put this kind of engineering leadership to work on *your* ore mining or processing problems, contact your local G-E Apparatus Sales Office—early in your planning. General Electric Co., Schenectady 5, N. Y.

660-27

Engineered Electrical Systems for Ore Processing

GENERAL ELECTRIC

You owe it to yourself to check...

"KOEHRING WORK CAPACITY"

7½ to 79½ TONS lift capacity . . . ½ to 2½ YARDS dipper capacity

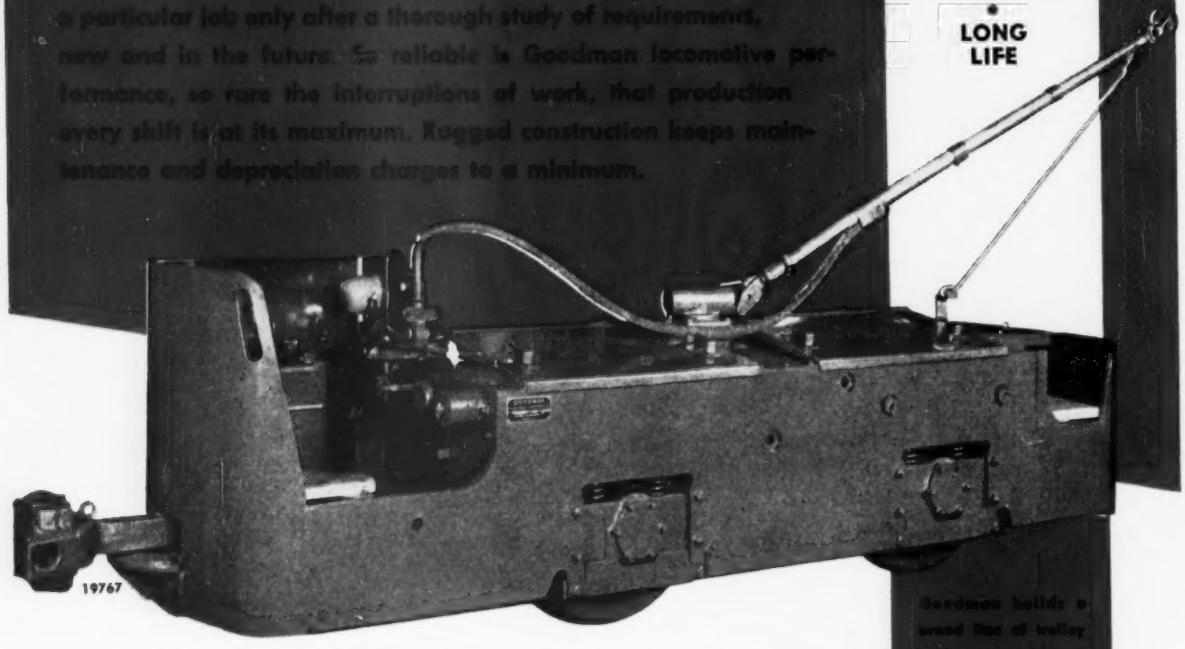
With any crane or excavator, all mechanical features, operating advantages, speeds and capacities add up to one deciding factor . . . cost per ton lifted or yard moved. Make sure you get the biggest profit advantage; ask your Koehring distributor for specific figures on "KOEHRING WORK CAPACITY".
KOEHRING COMPANY
MILWAUKEE 16, WISCONSIN

You profit 4 ways when you buy

Goodman
METAL MINE LOCOMOTIVES

Each Goodman haulage locomotive is recommended for a particular job only after a thorough study of requirements, now and in the future. So reliable is Goodman locomotive performance, so rare the interruptions of work, that production every shift is at its maximum. Rugged construction keeps maintenance and depreciation charges to a minimum.

SAFE OPERATION
•
CONTINUOUS SERVICE
•
LOW MAINTENANCE
•
LONG LIFE



Goodman builds a broad line of trolley and storage battery locomotives. This member of the family group is a 6-ton unit built to 24 inch gauge, with 24 inch wheelbase. Each of its two motors is 30 hp., 250 volt. The drawbar pull is 2000 lbs. at 6½ mph.

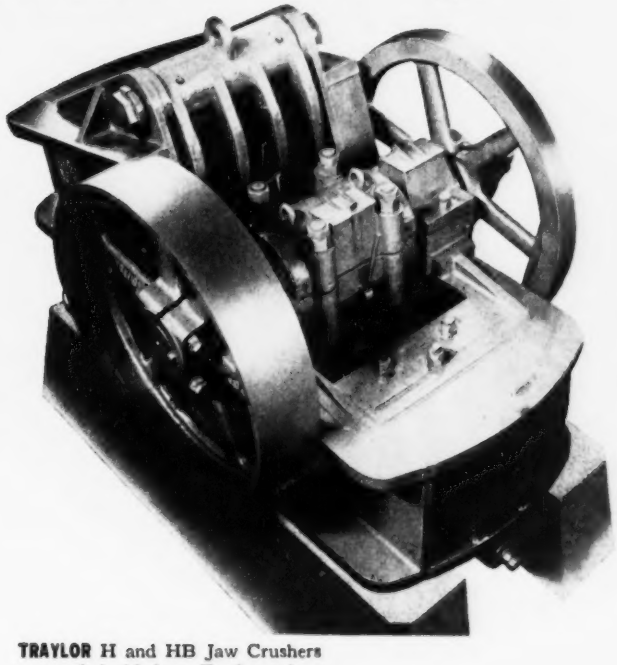
Typical design features in Goodman metal mine locomotive construction:

- all electrical and working units fully protected from water and muck
- quick acting lever-type brake
- strong protective shield for motorman and trip rider
- anti-riding safety guards on axle boxes and over brake rigging
- transverse equalizers for top track performance
- ball bearing base trolley pole; uniform pole tension against wire at all times
- Willison automatic coupler with detachable coupler support for minimum caging length

Catalog CH-521 describes in detail the Goodman line of locomotives for metal mines. Send for a copy today.

Goodman MANUFACTURING COMPANY
HALSTED STREET at 48th • CHICAGO 9, ILLINOIS

Built for Endurance



TRAYLOR H and HB Jaw Crushers are made in 14 sizes. Feed openings from 8" x 12" to 56" x 72". Capacities from 4 to 640 tons per hour.

Traylor Curved Jaw Plates outwear conventional types three to one

In scores of installations, the records show that Traylor Curved Jaw Plates outlast ordinary plates 3 to 1. For instance, records kept on a 36" x 48" crusher set at 4" to 5" show the average life of straight jaw plates to be 96,500 tons per set. Traylor curved Jaw Plates fitted to this crusher, and set at 3" to 3½", averaged 276,724 tons.

Here's why: Traylor Curved Jaw Plates apply power as a direct crushing force. The swing jaw plate exerts power directly counter to its opposing plate. This lessens lifting and churning of material to greatly reduce plate wear. As wear does gradually occur, it is evenly distributed so that Traylor plates retain their original curved shapes indefinately.

Although Traylor Jaw Crushers offer greater capacities . . . even at finer settings . . . they actually reduce power requirements. For the full story, clip the coupon and get our illustrated bulletin.

TRAYLOR ENGINEERING & MFG., CO.
522 MILL ST., ALLENTOWN, PA.

SALES OFFICES: New York • Chicago • San Francisco
Canadian Mfrs: Canadian Vickers, Ltd., Montreal, P.Q.

A Traylor LEADS TO GREATER PROFITS

Send complete specifications and descriptions of Traylor H and HB Jaw Crushers immediately.

Name: _____

Position: _____

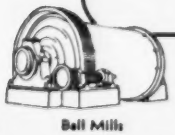
Company: _____

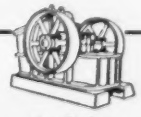
Address: _____ State: _____

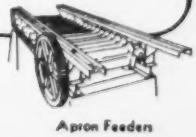
Primary Gyratory Crushers

Rotary Kilns

Secondary Gyratory Crushers


Ball Mills


Jaw Crushers


Apron Feeders

WHAT *Life-Line* REALLY DELIVERS IS MORE SERVICE...LESS SERVICING

"Whips Trouble Spots" Say users of these *Life-Lines*

"Neither Vibration Nor Moisture Are Problems Now," says the Richard Ore Co. "We installed 7 Westinghouse Life-Linestarters® in a particularly difficult application, a mine concentrating mill. We were off to a flying start immediately—the Westinghouse Life-Linestarter is easier to install because of straight-through wiring and the arrangement of breaker and starter in a single enclosure. Outages due to moisture and vibration have been virtually eliminated. That had been our biggest headache . . . more Life-Lines will be installed shortly."

"No Motor Failures of Any Kind, Now," says Watchcase Manufacturer. "Our punch-press motors were 14 feet off the floor . . . just high enough so that lubrication was often 'forgotten'. Frequent bearing failures and burnouts resulted until we 'perched' pre-lubricated Life-Lines up there two years ago. Since then . . . no failures of any kind. We've standardized on Life-Lines."

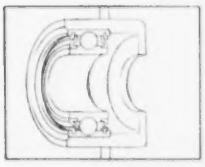
"Straight-Through Wiring Answered My Problem," says the Baker Refrigeration Corp. "We have a new air-conditioning design that requires the use of two starters. We found that the Westinghouse Life-Linestarter could be more easily mounted in a group within our enclosure—saved assembly labor. This completely sold me on your straight-through wiring."

"Increase Bearing Life 8 Times," says Oak Hill Firebrick Co. "We were using sleeve-bearing motors on a shaker screen in a firebrick plant. Bearings never lasted over six months. Life-Lines installed over four years ago have been running 16 hours a day ever since. Pre-lubricated bearings have been perfect."

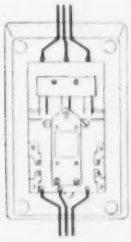
Typical? Yes. Typical of hundreds of reports in every industry. Why not install these dependable partners on your machines? A check with your Westinghouse representative will bring you full details. Ask for copies of "Life-Line Motor Case History Book", B-4769-A and "Tomorrow's Starter Today", B-4677, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21697-A

YOU CAN BE SURE...IF IT'S

Westinghouse



Needs no lubrication. Pre-lubricated, factory-sealed bearings eliminate troubles due to under or overlubrication, dust and dirt.



Straight-through wiring. Three line terminals at top; three load terminals at bottom—all easily reached from front.

Bonderite-protected starter enclosure. Anchors enamel as if it were part of steel itself. Finish will not blister or corrode.

DRAWPOINT LOADING

MECHANICAL LOADING SAVES TIME—MONEY SPEEDS PRODUCTION INCREASES SAFETY

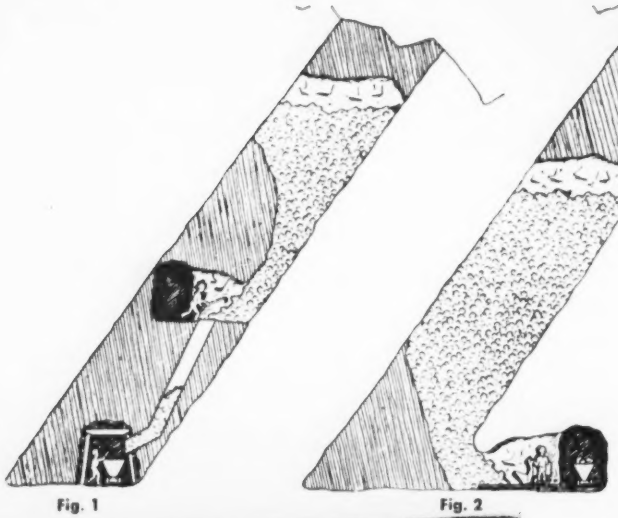


Fig. 1

Fig. 2

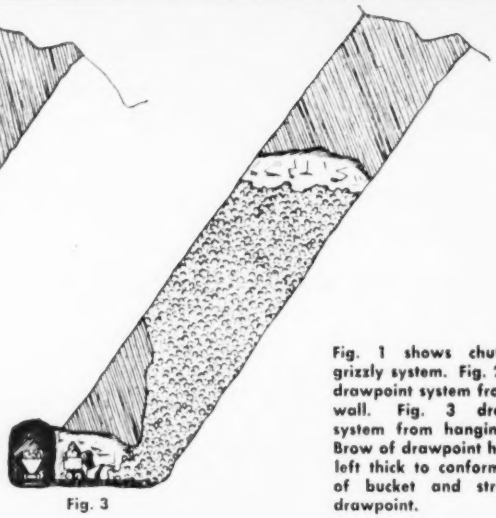


Fig. 3

Fig. 1 shows chute and grizzly system. Fig. 2 shows drawpoint system from footwall. Fig. 3 drawpoint system from hanging wall. Brow of drawpoint has been left thick to conform to arc of bucket and strengthen drawpoint.

Eimco loaders will load cars full, handle larger pieces than could be permitted through grizzlies and eliminate spill (usually prevalent in chute loading).

Mechanical loading from drawpoints has been proved most economical by mining companies that have used both the mechanical loader and chutes and grizzlies. Some of their findings are as follows:

(a) Faster development, quicker production. (b) Less cost per installation. (c) Greater safety. (d) Elimination of chute maintenance and repair. (e) Fewer men required. (f) Flexibility of equipment permits operation in more than one drawpoint. (g) 100% salvage of installation when all ore is drawn.

Write for Bulletin L1017 on drawpoint loading with efficient Eimco Loaders.

EIMCO A430

THE EIMCO CORPORATION

The World's Largest Manufacturers of Underground Rock Loading Machines

EXECUTIVE OFFICES AND FACTORIES: SALT LAKE CITY 10, UTAH, U. S. A.

BRANCH SALES AND SERVICE OFFICES:

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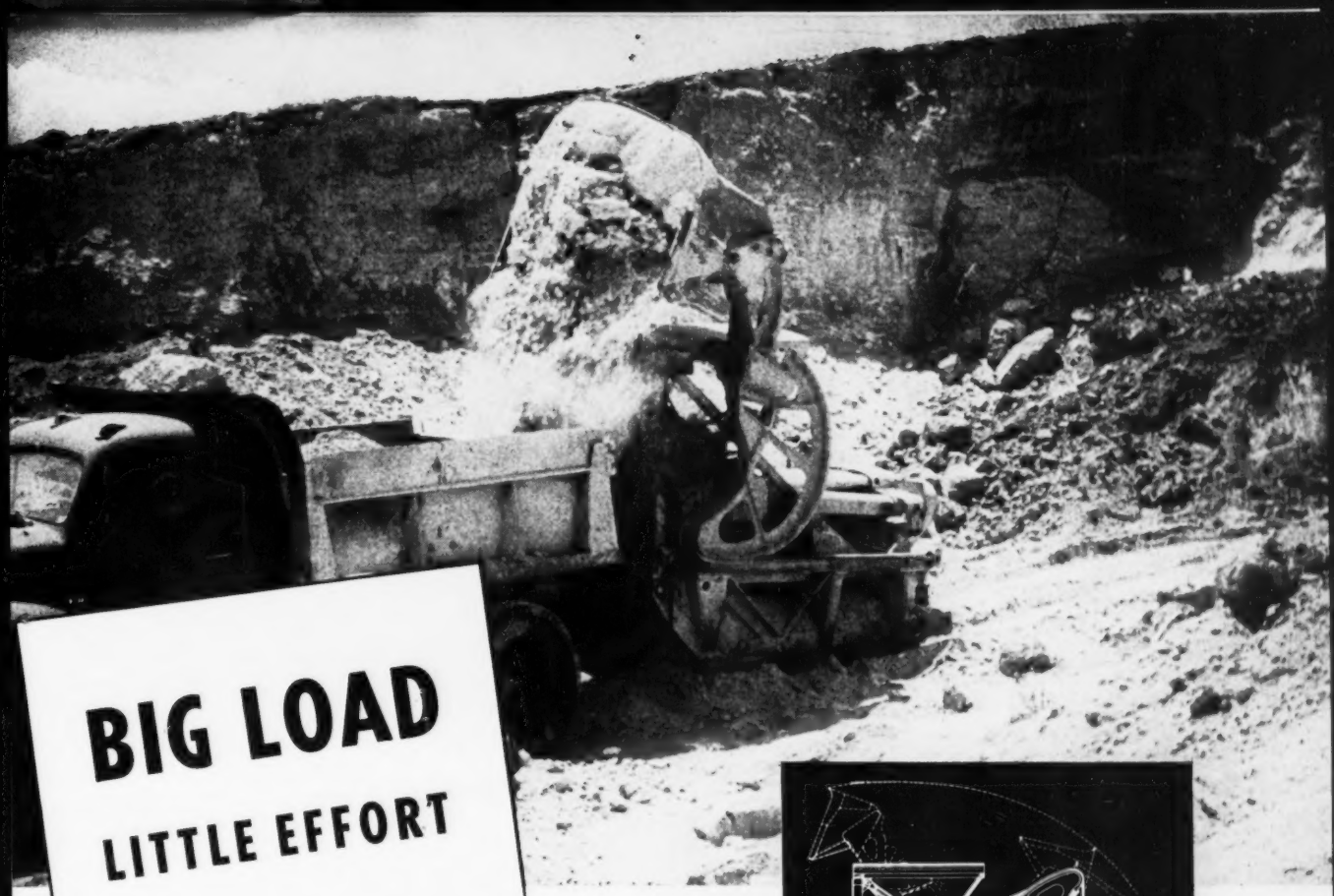
EL PASO, TEXAS: MILLS BUILDING • BERKELEY, CALIF.: 637 CEDAR STREET
KELLOGG, IDAHO: 307 DIVISION ST. • LONDON W. 1, ENGLAND: 190 PICCADILLY

IN FRANCE: SOCIETE EIMCO, PARIS, FRANCE
IN ENGLAND: EIMCO (GREAT BRITAIN) LTD., LEEDS 12, ENGLAND
IN ITALY: EIMCO ITALIA, S.P.A., MILAN, ITALY



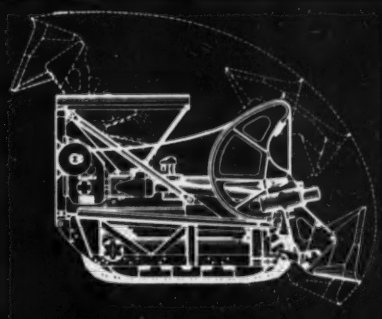
BIG LOAD
LITTLE EFFORT

Loads like this were considered jobs for big heavy equipment not long ago — but today loads this big or bigger can be handled easily with plenty of horsepower in reserve in the power unit.

The secret of the Eimco 104 is in better engineering, better steel castings and the rocker-arm principle described at right — where effort is applied to obtain a maximum in mechanical advantage.

Eimco 104's are heavy-duty loaders. They'll handle rock as easily as sand and gravel. Bucket sizes vary with material being loaded with an average job loading rate of between 200 and 300 yards per hour depending on job conditions.

Eimco 104's are being used for highway maintenance, heavy earthmoving, contracts, tunnels, steel mills, sand and gravel pits and many other jobs. Write for more information on Eimco loaders. Built in 6 different models for all loading jobs.



The rocker-arm principle is used on all Eimco Loaders. This principle, designed to give maximum force at the digging lip while the bucket is being worked up through the muck pile permits crowding forward at the same time so that the bucket will come up full every load.

EIMCO A431

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EXECUTIVE OFFICES AND FACTORIES — SALT LAKE CITY 10, UTAH, U. S. A.

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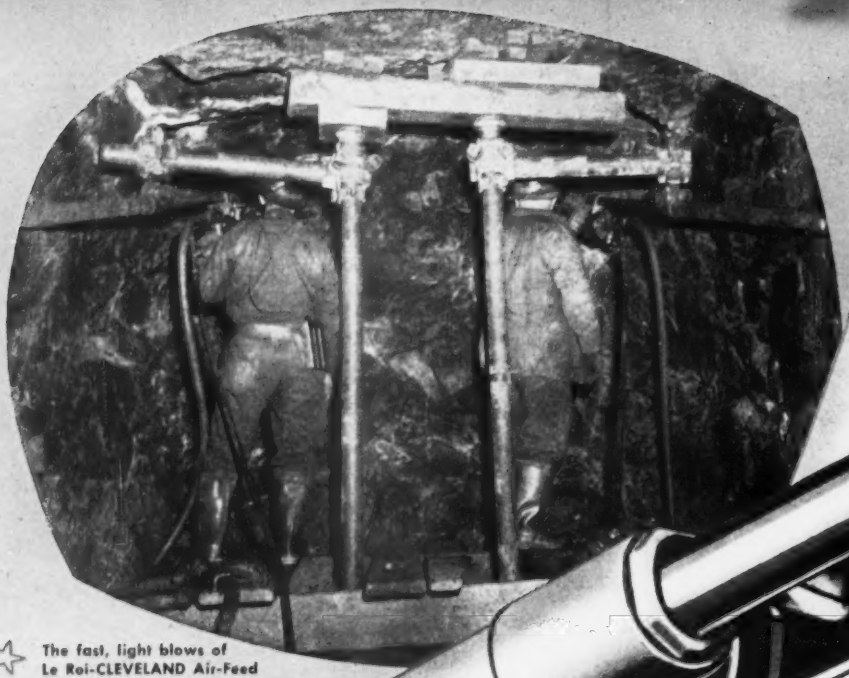
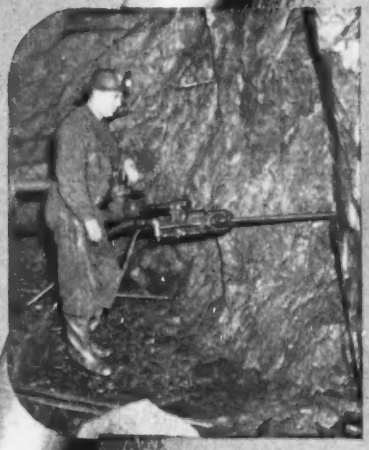
KELLOGG, IDAHO, 107 DIVISION ST. • LONDON W. 1, ENGLAND, 190 PICCADILLY

IN FRANCE, SOCIETE EIMCO, PARIS, FRANCE
IN ENGLAND, EIMCO (GREAT BRITAIN) LTD., LEEDS 12, ENGLAND
IN ITALY, EIMCO ITALIA, S.P.A., MILAN, ITALY

You can't beat an Eimco



The fast, light blows of Le Roi-CLEVELAND Air-Feed Drifters are just right for carbide bits. You get maximum bit life — can use smaller bits for higher drilling speeds.



Le Roi-CLEVELAND Air-Feed Drifters take the back-breaking work out of drilling horizontal holes.

The HC23 can be used with coupled steel to drill 70' holes — ideal for ring-drilling.

Tonnages go up!

Drilling costs go down!

with Le Roi-CLEVELAND Air-Feed Drifters

YOU lighten the load on miners — take the hardest part of the work out of drilling — when you equip them with Le Roi-CLEVELAND Air-Feed Drifters. Men don't tire so fast — safety records improve — tonnages rise.

Here are some reasons why: (1) You can use the Model 83 lightweight pneumatic air column to speed set-ups. (2) Fast reverse feed makes changing steels quick and easy. There are no swing or dump nuts to loosen or tighten. (3) Positive air feed gives right pressure for maximum drilling speed. (4) Fast, light blows are just right for carbide bits.

Le Roi-CLEVELAND Air-Feed Drifters are available in two sizes: HC10R with $2\frac{5}{8}$"-bore machine and HC23R with $3\frac{1}{8}$"-bore machine. See how either model gives you longer bit life, lets you use smaller bits for higher drilling speeds — helps you get higher man-shift production, greater safety, and lower drilling costs. Write for further information.

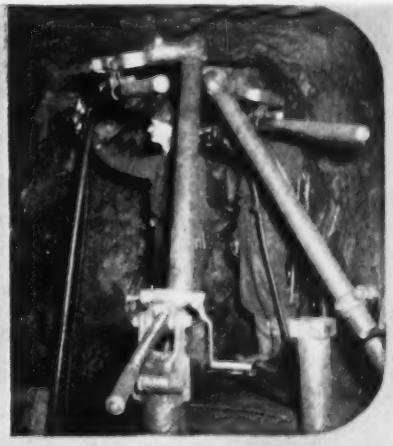
LE ROI COMPANY — CLEVELAND ROCK DRILL DIVISION

Plants: Milwaukee, Cleveland and Greenwich, Ohio

12500 Berea Road, Cleveland 11, Ohio

☆ Le Roi-CLEVELAND Air-Feed Drifter mounted on air-motor-powered boom of Le Roi-CLEVELAND Self-Leveling Mine Jumbo in a Western zinc and copper mine.

☆ Feed controls are conveniently located on Le Roi-CLEVELAND Air-Feed Drifters. Reverse air feed withdraws steel from hole quickly.

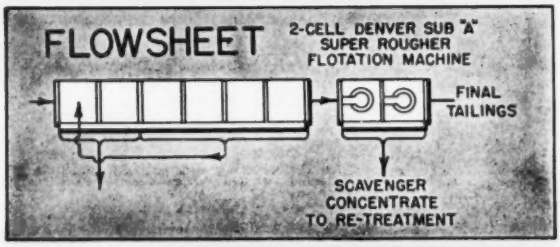


☆ The accent's on production in this mine. Le Roi-CLEVELAND Air-Feed Drifters make possible faster set-ups, faster steel changing, faster drilling.

RD-50

Recovery of minerals normally lost in tailings has been amazing due to use of the New Denver "Sub-A" Super Rougher Flotation Machine. The ability of these machines to lower tailings and *pay for themselves in a short time* has been proved.

NEW DENVER "SUB-A" SUPER ROUGHER REALLY GETS PROFITS FROM TAILING CIRCUIT

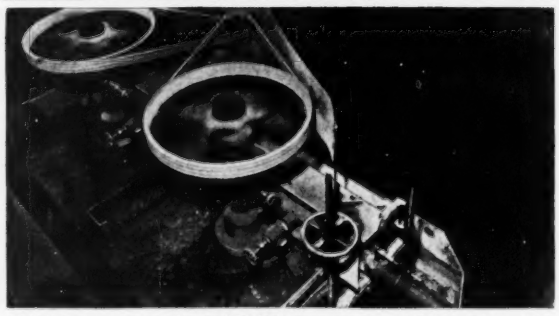


New "Sub-A" Principle

The New Denver "Sub-A" Super Rougher Flotation Machine has a double impeller mechanism—one imposed above the other. The upper impeller gives additional aeration and lifts lagging mineral over the froth overflow. This super aeration gives a deep frothy concentrate. The openflow type tank design handles large tonnage. Froth overflows both sides for quick removal of the difficult to float minerals. Many features of flexibility are provided to give the operator an opportunity to adjust cells for the particular ore being treated.

Trial Offer

We are so confident that Denver "Sub-A" Super Rougher Flotation Machines will lower tailings in your mill that we want you to see for yourself what this machine will do. We will send you one of these NEW Denver "Sub-A" Super Rougher Flotation Machines to try out in *your* mill. If you are not satisfied, just return the machine to us without obligation.

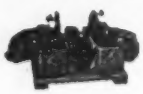


ABOVE: Operators estimate $30,000 per year saved by lowering tailings losses. BELOW—another new large mill equipped with Denver "Sub-A" Super Rougher Flotation Machines. See for yourself in your own mill what they will do for you.

DENVER EQUIPMENT CO.
1400-17th STREET
DENVER 17, COLORADO
Phone Denver CHerry 4466

. . . Over 25 years of Flotation Engineering

Denver Disc Filters

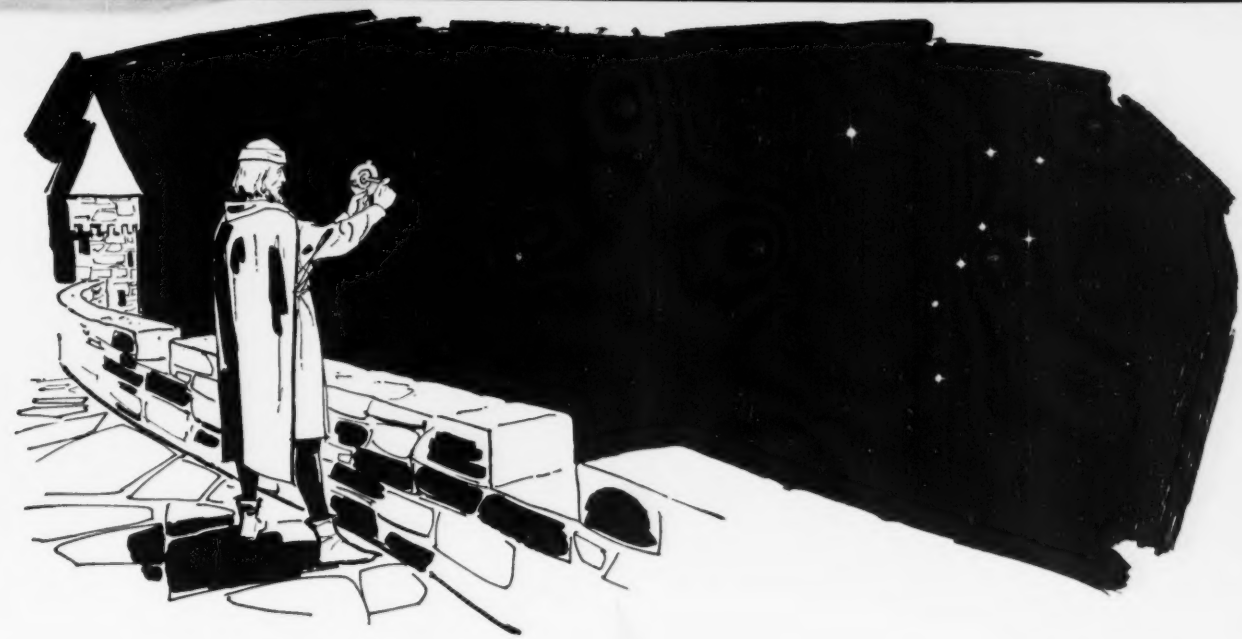

Denver Reagent Feeders

Denver Standard Dryers

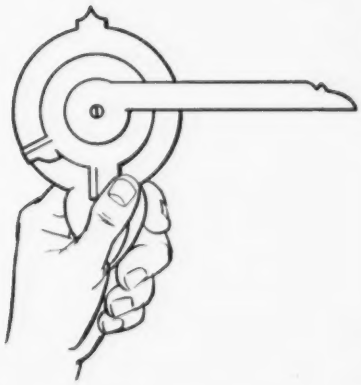
Denver Ore Feeders

Denver Wilfley Tables

Denver Crushing Rolls



The first Watch with Illuminated Dial



The science of reckoning the hour was making great progress about the time that Columbus discovered America. For now, it was possible to tell the time at night—approximately, that is—and only on clear nights, and provided that you lived in the Northern Hemisphere. All you had to do was hold up the Nocturnal at arms length, sight the Pole Star through the center hole and line up the two pointer stars of the Big Dipper with the bottom of the arm on the Nocturnal. Then, if the moon were bright enough or you happened to have brought along a lighted lanthorn, you could look at the scale and read the time. This was wonderful but unimportant, because the pattern of man's days was still dictated by the number of daylight hours and would so continue for centuries. Today, at the drilling rig, daylight or dark make little difference. What counts is the drill bit. If you depend upon Truco Diamond Bits you get irresistible cutting power in any formation; swift, accurate, thrifty penetration that reduces rig time and pays off handsomely in cash savings. May we send you our Diamond Bit Catalog?

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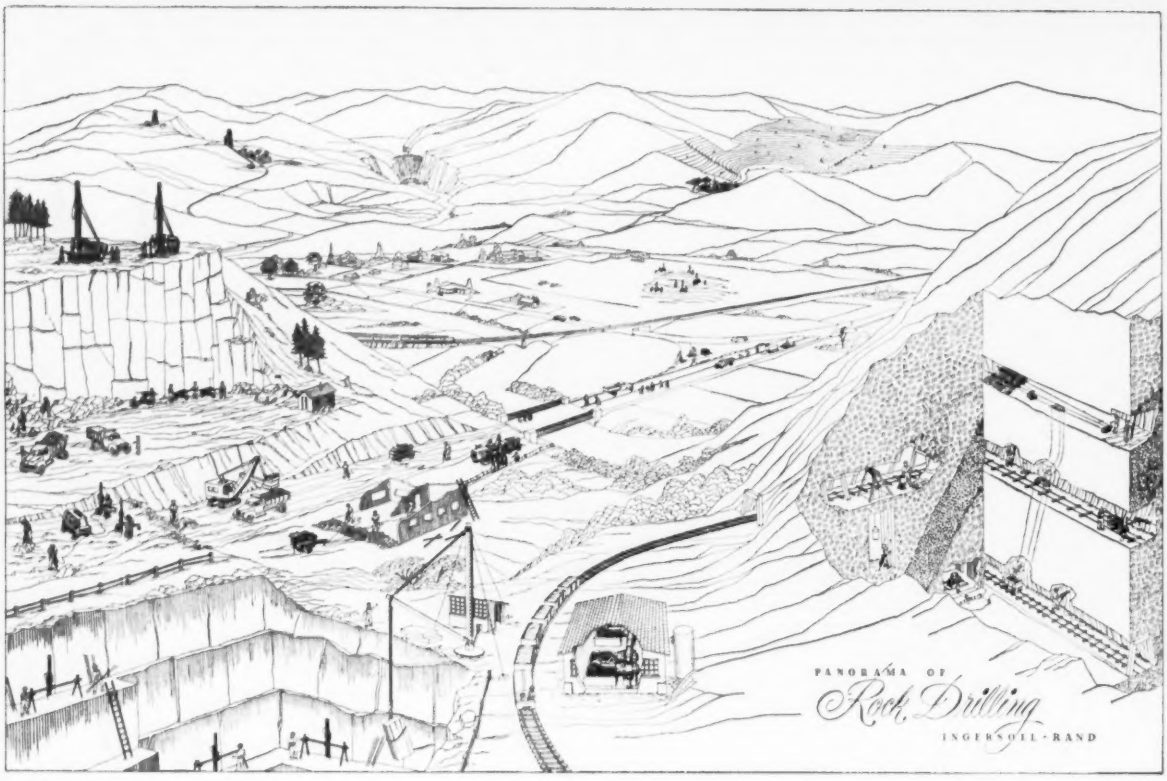
3200 W. Davison Avenue, Detroit 6, Michigan

WHEEL TRUEING TOOL CO. OF CANADA, LTD.
575 Langlois Avenue, Windsor, Ont., Canada



Enlarged prints of this interesting and instructive drawing are available free of charge for schools, colleges and field offices. Write for a copy today.

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- Stopehamers
- Wagon Drills
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- Diesel Engines

No matter what you need for drilling rock,

IT'S INGERSOLL-RAND EVERY BIT OF THE WAY!

Where does I-R fit into the rock drilling picture? Just about EVERYWHERE—as you can see from the above drawing in which the artist has included practically every rock drilling application.

But there's more here than meets the eye. For Ingersoll-Rand can supply everything from the Carset Jackbit all the way back to the compressor. From one source with undivided responsibility, you get a coordinated line of equipment that's designed to work together with maximum efficiency. You get complete service, too—backed by 80 years of experience and leadership in this specialized field.

Make Ingersoll-Rand your headquarters for everything in rock drilling.

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ROCK DRILLS • COMPRESSORS • AIR TOOLS • CENTRIFUGAL PUMPS • TURBO BLOWERS • CONDENSERS • DIESELS • GAS ENGINES

LeTourneau pictures of the month . . .

MINES IRON AT 30° BELOW — 215 miles north of the Arctic Circle at Kirkenes, Norway, 2 C Tournatractors work 24 hours a day, 365 days per year. Their task, vital to the Norwegian defense effort, includes shovel clean-up and haul road maintenance in one of the largest open magnetite pits in Scandinavia. Some 2,300,000 tons of ore are being removed annually The pit is 350 ft deep. Despite the grades, subzero arctic weather and abrasive material, Tournatractor efficiency has been very high. Rig's tires have required no repair. Greasing, required only once every 10 shifts, can be done in about 15 minutes. Overall maintenance needs are low. Equipment owner is Sydvaranger A/S of Oslo, leading European contracting firm.

CARRIES 50 TONS PER LOAD — Here hard at work in the Pennsylvania anthracite fields is one of Colitz Coal Co.'s three 50-ton Tournarockers. Behind a 450 hp butane engine, these rigs carry 41 pay yards per load. They are 36 ft long overall, yet turn in a radius of 15 ft 8 in. With Tournarockers, you can forget many of your old rear-dump troubles. These rigs have no frame, sub-frame, springs, tie rods, or hydraulics. Electric push-buttons control steer, dump, shift.

See next page

LeTourneau pictures of the month (cont'd) . . .

DIG 2.9-MILE TUNNEL THROUGH SOLID ROCK

These rigs are not toys. That's a 2¼-yd shovel, loading one of six 18-ton LeTourneau haul units used on this job. They are digging a sloping 2.9-mile-long, 40-ft high tunnel through tough, sharply-fragmented gneiss-type rock to connect two lakes in Sweden. The fall of water through the tunnel from one lake to the other will provide electrical power. Tunnel is only 36 ft wide, yet Tournarockers turn around easily in one continuous sweep. Loads average 18 tons each. Production averages 36 tons hourly over typical 2¼-mile cycles. Digging is so tough that only 20 lineal ft of tunnel is opened per day. "In spite of severe conditions, repair and maintenance costs have been very low," says S. Westby, chief engineer on the 785,000-yd project, one of the largest ever contracted in Sweden. "Tournarocker's greatest advantage is its maneuverability and short 13 ft 9 in. turning radius."

Performance reports on LeT equipment in action

HUNTS OIL IN 150° HEAT — 250 miles from the nearest oasis, this Tournadozer is really getting a rough workout. Used by the Iraq Petroleum Co. exploration crews in eastern Arabia, it prepares drill locations, levels camp sites, and builds haul roads. Rig works 10 to 18 hrs a day in temperatures which hit 150° in the daytime, then drop to 35° at night. Material is mostly desert sand with occasional outcroppings of coral and sandstone. Only servicing required in the past year has been routine weekly inspections.

MINES SHALE IN TEXAS — By mining 250 tons of slacked shale daily with their self-loading D Tournapull, Acme Brick Co., Fort Worth, Tex., cut man-hour requirements 75%. Single "D" replaces a dump-truck and front-end loader. It handles in 4¼ hrs the same job that formerly took 17 man-hrs to complete. "D" self-loads 5 bank yds of shale, hauls 0.4 mile to crusher bin, dumps and returns to pit in 4.5 min. Performance here led to purchase of 3 more units for other Acme pits in Malvern, Ark, Clinton, Okla, and Baton Rouge, La.

DRIVES 755 MI IN 34 HRS — Rogelio Viesca, Mexico City contractor, recently took his rubber-tired Tournapulls on a long journey. Rigs drove over paved highways, through cities and towns, and across 8,000-ft mountains to reach Mexico City from Laredo, Texas. They made the 755-mi trip in 34 hrs, total driving time (an average of 22 miles an hour) . . . went to work on construction of a new spur line for Pemex Oil Co. the day they arrived at the job site.

WORKS UNDER WATER — Tournapull wades across 5-ft river on the way from Panama City to Pan American Highway job near David on the Costa Rican border. Though water covered generator, rig's electric controls were not affected, reports Owners Vallarino & Arias. That's nothing unusual, though. Water never stops the LeTourneau electric motors or generator. One motor, operated underwater for 4 yrs as a test, still runs as well as ever.

See next page

LeTourneau pictures of the month (cont'd) . . .

6000 HRS, 90% EFFICIENT — All feeding for this portable asphalt plant, run by Miss. State Highway Dept at Hattiesburg, is handled by Tournatractor. Plant output averages 770 tons per 9-hr day. After 3½ yrs (over 6,000 hrs) work in sand and gravel, rig has been 90% efficient . . . still has original tires. "Haven't had a minute's trouble with them," says Plant Supt Grady McCardle. Tracks would have needed at least 5 or 6 complete overhauls during same period.

7 JOBS IN 10 HRS — In Minn the Coons Co. handles scattered jobs with Tournatractor. In a typical 10-hr shift, rig maintains 2 overburden dumps, stockpiles lean ore, cleans up for 3 shovels, maintains haul roads.

BEATS WINTER SHUTDOWN — Frank Whitcomb works his 2 rear-dump Tournarockers 12 months a year. In New Hampshire, where he does most of his work, temperatures often drop well below zero. But no matter how cold it gets, Tournarockers dump any material that can be loaded. Electrical induction body heating keeps loads from freezing. When unheated trucks have to be used under similar cold weather conditions, they must be cleaned out by a small pull shovel.

3½-MINUTE MILE — Lehigh Portland Cement Co, Albany, NY, uses this D Tournarocker to haul waste. Unit loads 12 yds, hauls 1 mi to dump in 3½ min. With front-wheel drive, Tournarocker backs safely to edge, dumps clear over bank. Saves expensive cleanup.

"VERY FAST AROUND A SHOVEL" — Stripping year-round for Diamond Portland Cement Co, Ohio, Tournatractor breaks up and dozes 15 to 18" of shale to shovel. As needed for cleanup, machine runs 3 miles to plant or drives into pit for shovel service. Operator Elon Gallineau says, "This machine is dynamite!" Plant Mgr E. R. Evans says, "Rig will move as much shale in half a day as our crawler can in a full day."

R. G. LeTOURNEAU, INC., PEORIA, ILL.

LETOURNEAU LET EQUIPMENT

Tournatractor—Trademark Tournarocker, Tournapull—Trademark Reg. U. S. Pat. Off. Pic. 310-M

Holes loaded and ready to shoot.

Peak of blast. Confinement is good.

Spent gases appear—air blast avoided.

Well placed final pile. Throw controlled.

the inside story

Here's how ROCKMASTER® blasting helps control throw

THIS blast area on By-pass Route 22, Easton, Pa., was adjacent to gasoline storage tanks, homes, a parking lot, business establishments and a precision instrument factory. It was a ticklish blasting problem for Central Pennsylvania Quarry, Stripping and Construction Co., contractors on the job. Absolute control was a "must." Flying rocks had to be minimized . . . along with noise and vibration.

The ROCKMASTER pattern illustrated above was designed to keep blasted material from falling down the slope. The holes were carefully loaded and adequately stemmed. As the blast was fired, it advanced in alternate delay periods from ROCKMASTER No. 1 to No. 6. The row toward the slope fired first and gave relief for subsequent rows. The general heave inclined toward this relief—up the slope.

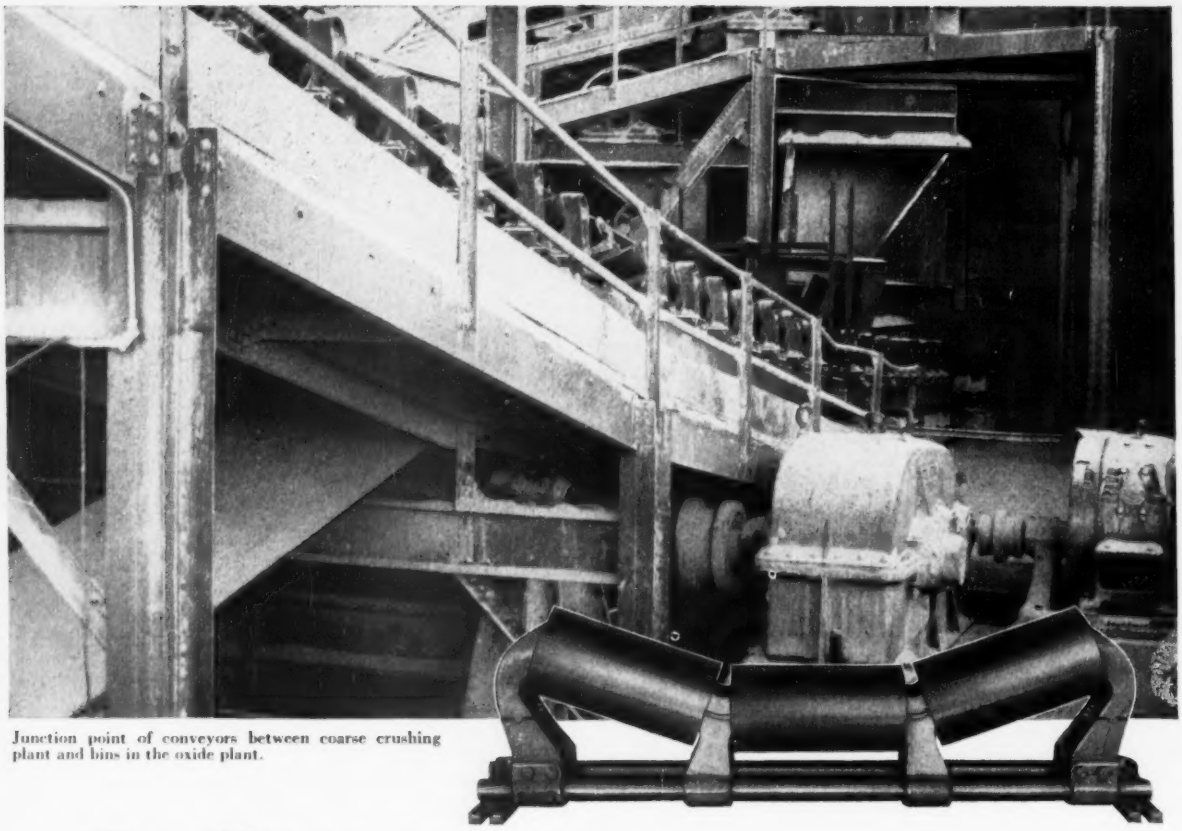
When you have shooting problems like this, ROCKMASTER can help you too. Send for your copy of the ROCKMASTER Blasting System Booklet.

ATLAS EXPLOSIVES

"Everything for Blasting"

ATLAS POWDER COMPANY, WILMINGTON 99, DELAWARE

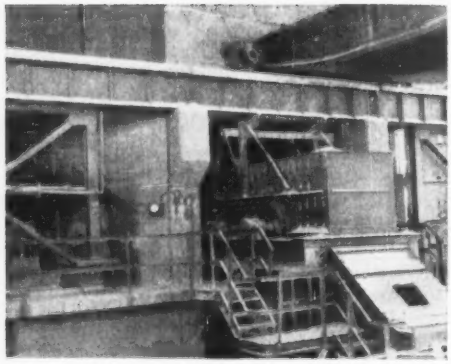
Offices in principal cities



Junction point of conveyors between coarse crushing plant and bins in the oxide plant.

SIX MILES of Conveyor Belts

Ride on S-A CARRIERS at CHILE EXPLORATION CO.'s Chuquicamata Plant



S-A Amsco Feeder in the secondary crushing plant. This is one of six Amsco Feeders used at Chuquicamata.

More than 2500 of these S-A Carriers have been in service for a quarter of a century. All of this group are in the multi-million ton class—*and are still going strong!*

When the huge new sulphide plant was built—and with this record to go by—enough S-A Carriers to equip 2½ miles of new conveyor belts were installed.

Most of the Carriers used are S-A "444" Heavy Duty Carriers especially designed for maximum operating economy and long life. Their unique "tip-back" feature enables Carriers to be inspected without shutting down the conveyor. Other Carriers on the job are S-A "Mammoths," probably the largest anti-friction units ever built.

Besides its Carriers, S-A has six Amsco Feeders on the job in the crushing plant.

We at S-A feel that there could be no greater tribute to the worth of S-A equipment than to be chosen—*and chosen again 25 years later*—by Chile Exploration Co. for its Chuquicamata operation.

STEPHEN S-A DAMSON MFG. CO.

4 Ridgeway Avenue, Aurora, Illinois — Los Angeles, Calif., Belleville, Ontario

DESIGNERS AND MANUFACTURERS OF ALL TYPES OF BULK MATERIALS HANDLING EQUIPMENT

Cut mill operating expenses to the bone!

Install longer-lasting U·S·S LORAIN ROLLED PLATE LININGS...

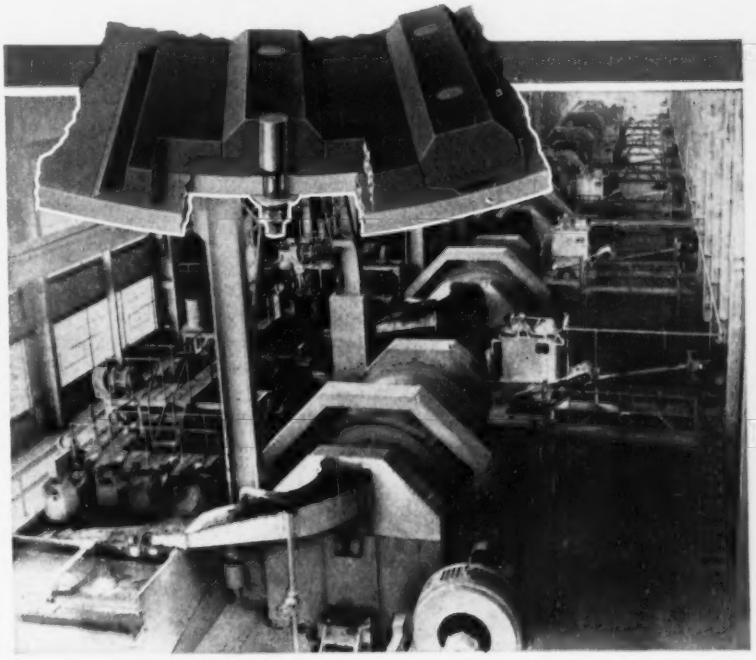
Save on every ton you grind!

NO matter what you grind, U·S·S Lorain Rolled Plate Linings will produce better grinding results, more economically. They're made in easy-to-handle sections that save hours of installation time. They keep mill down-time to a minimum. They're so rugged they'll wear 'til they're paper thin without failing!

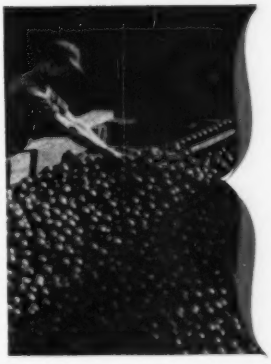
Made from top-grade *rolled steel*, Lorain Linings have far greater wearing life than regular cast linings. Their outstanding strength makes possible the use of thinner sections, saves first cost of metal . . . increases usable diameter of the mill, boosts output. The tight joints between ends of plates and close fit between plates and lift bars eliminate shell wash and allied troubles.

The Liner Plates of Lorain Linings are made symmetrical and interchangeable. Severe localized wear at feed or discharge end can be balanced by heat-treating. The Lift Bars, carefully designed to insure correct cascade action, are available in different lift heights to suit conditions. Lift height will remain approximately constant for life of the lining.

U·S·S Lorain Rolled Plate Linings are available—in the diameter, length and thickness best suited to your operating conditions—through leading mill manufacturers whose names will be furnished upon request.



Installation shows seven Allis-Chalmers' 10½' x 11' Ball Mills.



U·S·S GRINDING BALLS make better, more economical grinding doubly sure. Available in sizes from ¾" to 5" in diameter. For further information just return this coupon.

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U·S·S LORAIN ROLLED PLATE LININGS AND U·S·S GRINDING BALLS

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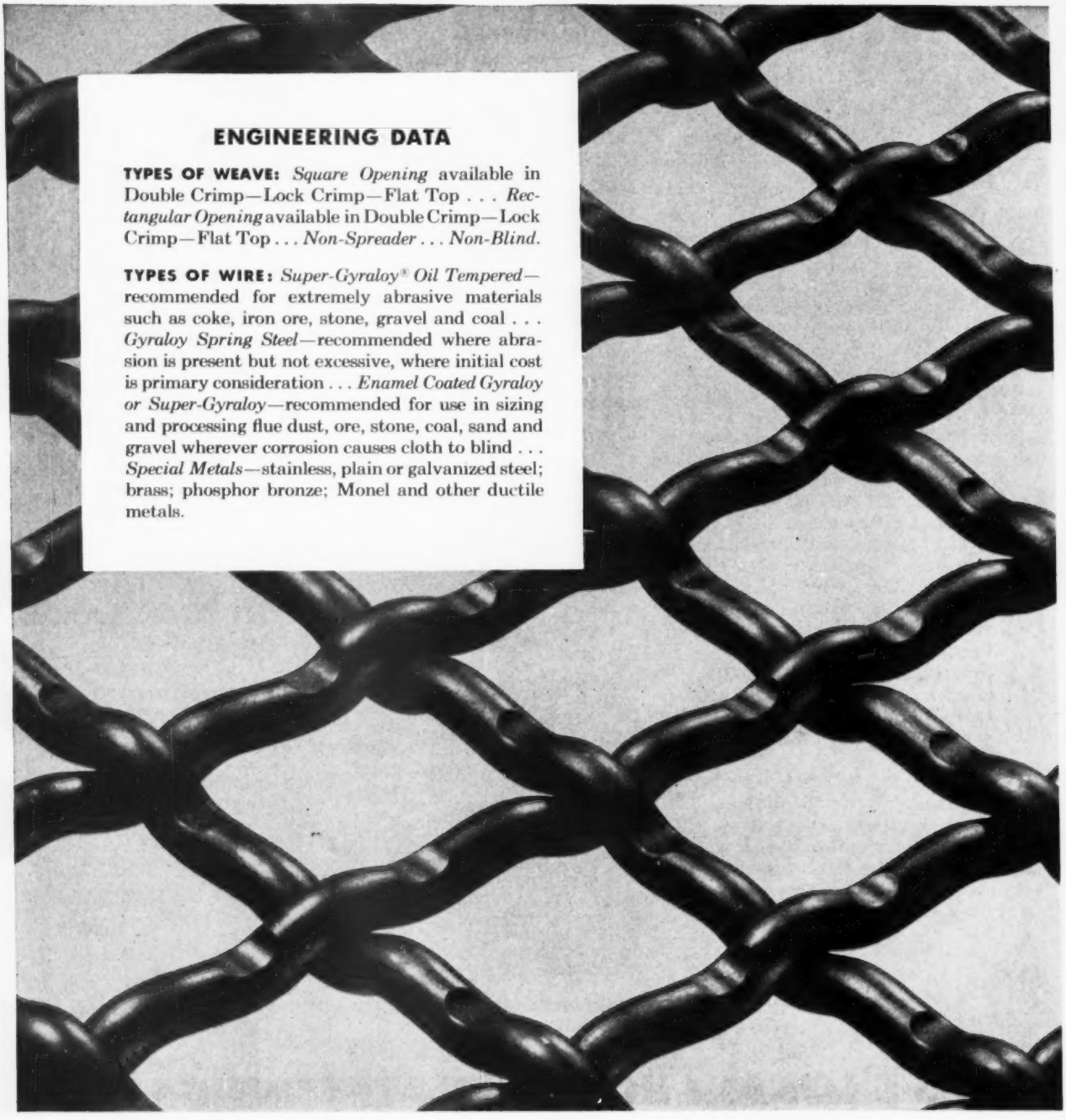

ENGINEERING DATA

TYPES OF WEAVE: *Square Opening* available in Double Crimp—Lock Crimp—Flat Top . . . *Rectangular Opening* available in Double Crimp—Lock Crimp—Flat Top . . . *Non-Spreader* . . . *Non-Blind.*

TYPES OF WIRE: *Super-Gyraloy® Oil Tempered*—recommended for extremely abrasive materials such as coke, iron ore, stone, gravel and coal . . . *Gyraloy Spring Steel*—recommended where abrasion is present but not excessive, where initial cost is primary consideration . . . *Enamel Coated Gyraloy or Super-Gyraloy*—recommended for use in sizing and processing flue dust, ore, stone, coal, sand and gravel wherever corrosion causes cloth to blind . . . *Special Metals*—stainless, plain or galvanized steel; brass; phosphor bronze; Monel and other ductile metals.

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HEWITT-ROBINS

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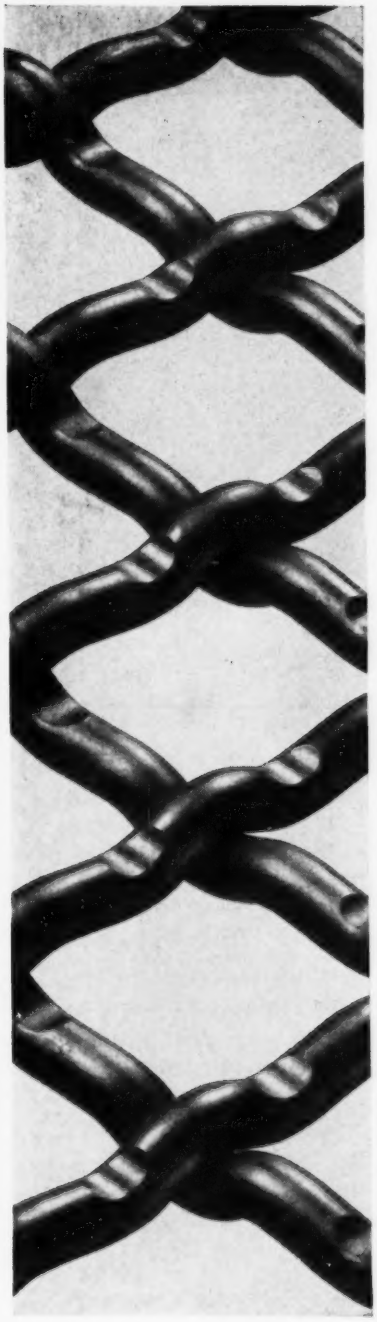
Screen Cloth Delivery



Increased Production Capacity Assures Faster Delivery For All Types Of Hewitt-Robins Screen Cloth

Now, we can give you faster delivery—*direct from our own modern plant*—of the finest quality screen cloth to meet your every need . . . Screen Cloth that gives you longer life, greater satisfaction on any type of screen, regardless of make . . . Screen Cloth that will provide you with highest efficiency, lowest cost per ton.

For shorter delivery on any type of Hewitt-Robins screen cloth send us this information:

1. Type of screen—Name of manufacturer—Model of machine.

2. Kind of screen cloth desired: Specify type *weave*—type of *wire*.

3. Size of clear opening or mesh and wire diameter.

4. Type of edge formation: Flat edges — Welded — Reinforced hook strips.

5. Length and width of panels (width measured from outside to outside of bent hooks)—Height and length of hook strips—Degree of angle inside of hook.

6. For rectangular, non-spreader or non-blind openings: Specify direction of long slot (which dimension of cloth it parallels).

7. For dewatering decks: Size of openings in mm—Single, double or no depressions—Round or triangular profile stainless steel rods.

WRITE FOR SCREEN CLOTH BULLETIN No. 113-A1

CHECK FOR INFORMATION ABOUT THESE JOB-TESTED PRODUCTS FOR YOUR OPERATION

CONVEYORS:
- ☐ —Belt
- ☐ —Dock
- ☐ —Ore Mine
- ☐ —Shuttle
- ☐ —Slope
- ☐ —Vibrating
- ☐ —Fixed Tripper Shuttle

BELTING:
- *☐ —Elevator
- *☐ —General
- *☐ —Hot Materials
- *☐ —Raynile®
- *☐ —Steel Wrapper
- *☐ —Transmission
- ☐ —Woven Wire
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SCREEN CLOTH:
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- ☐ —Dewaterizers
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HOSE:
- *☐ —Acid
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- *☐ —Servall®
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- *☐ —Pinch Valve
- *☐ —Twin-Weld®
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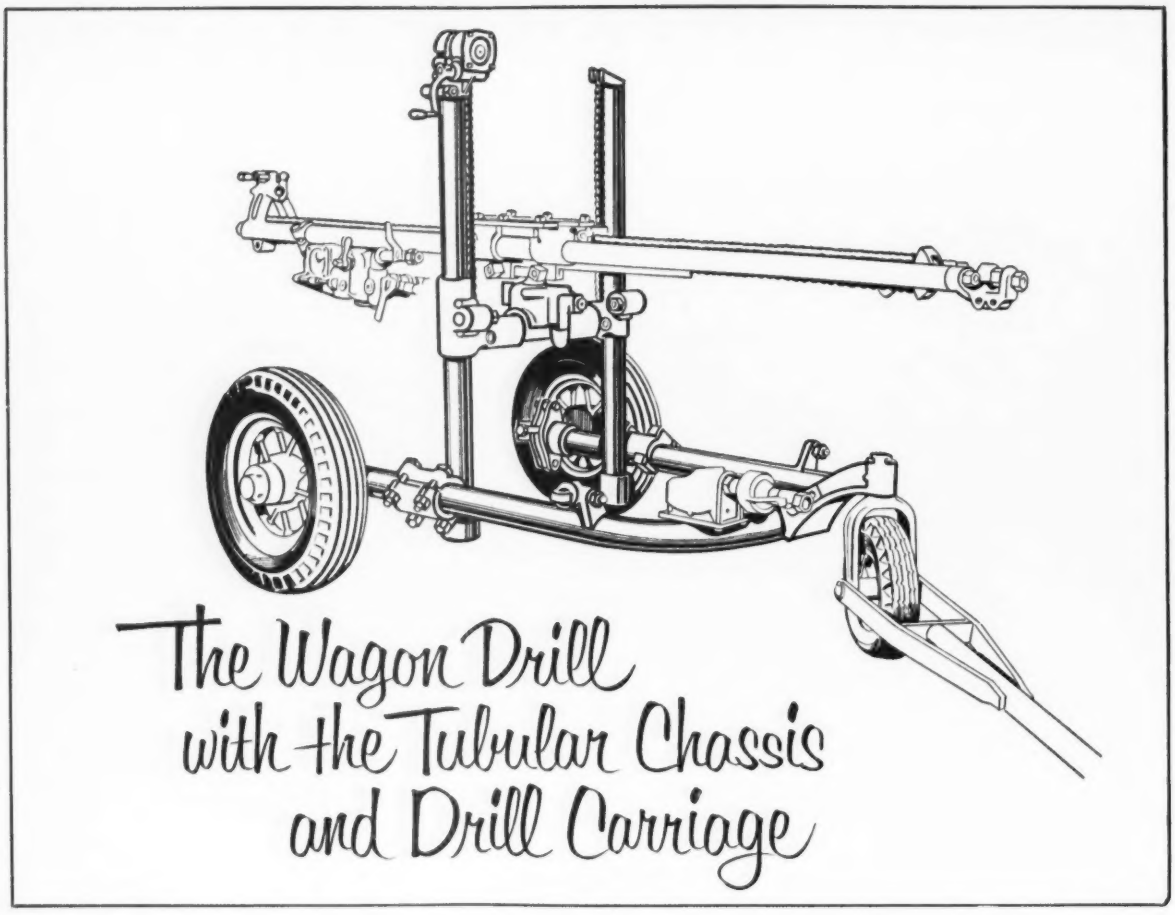
INCORPORATED

EXECUTIVE OFFICES: STAMFORD, CONNECTICUT



The Wagon Drill with the Tubular Chassis and Drill Carriage

G-300 Wagon Drill

The rugged tubular chassis and drill carriage of the G-300 WAGON DRILL provides rigidity and strength without unnecessary weight.

The tubular "H" structure that supports the drill carriage gives greater stability than the conventional design and minimizes vibration. The all-around sturdy construction of the G-300 maintains correct alignment at all times, insuring maximum drilling efficiency with minimum upkeep.

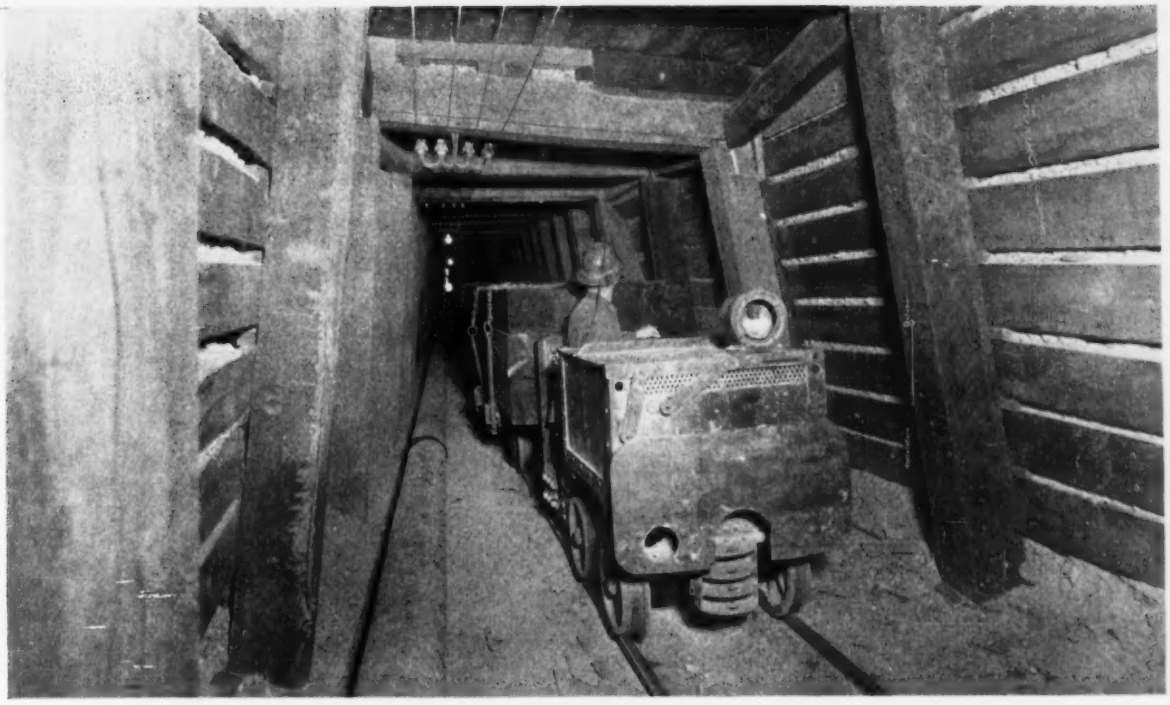
G-300 Wagon Drill

- is designed to take full advantage of the high drilling speed and strong rotation of the CP 4-inch 70-N Drifter.
- has controls conveniently centralized.
- is equipped with a specially designed feed motor and cone-gear drive for greater load-carrying capacity.
- has a heavy-duty centralizer.
- adaptable for all types of wagon drill work. Wheels can be turned at right angles to facilitate line drilling or drilling close to a ledge or wall.

Write for further information.

CHICAGO PNEUMATIC TOOL COMPANY
General Offices: 8 East 44th Street, New York 17, N. Y.

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES



MANCHA'S LITTLE TRAMMER

Operating wt., 1½ tons

Earns MORE . . . BECAUSE IT *saves* MORE

SAVES MAN-POWER
This powerful little storage battery locomotive does the work of a whole crew of hand trammers, and releases men for profitable labor.

SAVES TIME – CUTS LABOR COSTS
Payroll savings effected by the use of Mancha's Little Trammer are often enough to write off the cost of this locomotive in a very short time, because it not only hauls ore but can also be used to handle mine supplies.

SAVES MAINTENANCE EXPENSE
Years of development and perfecting in actual mine service have made Mancha's Little Trammer virtually trouble-free. Simple design, rugged construction make inspection easy, repair seldom necessary.

Important savings are assured, too, through the use of genuine Mancha replacement parts for the Little Trammer – or any Mancha Storage Battery Locomotive. Mancha-made parts meet rigid standards for fit, material, and workmanship. There is no variation. Their use is your guarantee of quick installation and continued long life.

Will a Mancha's Little Trammer pay in your mine?

You can find out easily and quickly. Send in the coupon for our "mine haulage data form." With the information you furnish, we can tell you how a Little Trammer can help you save money. So, whether or not you are in the market today, send the coupon and get valuable haulage data you can use now or tomorrow. There's no obligation.

Mancha Storage Battery Locomotive
Division **GOODMAN** *Manufacturing Company*
4850 South Halsted Street, Chicago 9, Ill., U.S.A.
E & MJ - 253
Send your mine haulage data form.

NAME _____

FIRM _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

MANCHA STORAGE BATTERY LOCOMOTIVE
Division **GOODMAN** *Manufacturing Company*
4850 SOUTH HALSTED STREET CHICAGO 9, ILL., U. S. A.

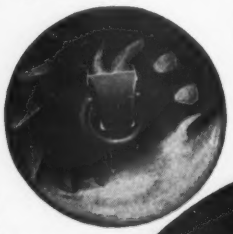
STURTEVANT

Dustless BLENDERS

Produce Perfectly Mixed Products with NO Loss of Materials

RECEIVING

The ingredients to be mixed enter the mixing chamber of the drum through a chute. Note scoops which carry up and dump the ingredients as the drum rotates.



DISCHARGING

By simply throwing a lever, the inlet is closed and the mixer is in discharging position. The completely mixed materials drop off the lifting scoops and discharge through chute without segregation of ingredients

Four-way mixing action produces homogeneous blends. No matter what the densities, weights, finenesses or other physical properties of the ingredients, Sturtevant Dustless Blenders provide *a thoroughly blended product* with no substances floating to remain unmixed. Sturtevant advantages include—single opening for both receiving and discharging . . . "open door" accessibility for quick, thorough cleaning . . . rugged construction for long life and minimum maintenance. Sturtevant Dustless Blenders are available in mixing capacities from 500 to 20,000 pounds. Write for information or engineering assistance.

STURTEVANT MILL COMPANY
101 CLAYTON STREET, BOSTON 22, MASS.

Designers and Manufacturers of

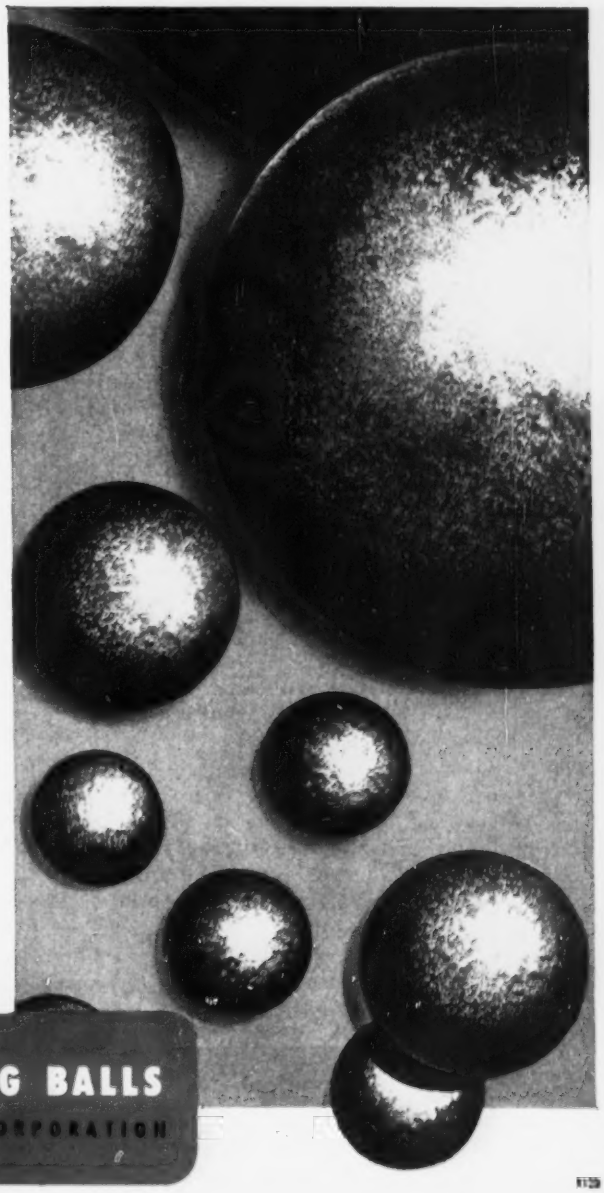
CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS
MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS

CF&I

STEEL PRODUCTS FOR THE MINING INDUSTRY

FORGED STEEL GRINDING BALLS

Good for the Long Grind



You'll find CF&I Grinding Balls where the going is toughest. They're forged from special analysis steel to give high impact and abrasion resistance... wear evenly and stay spherical.

If you have any grinding problem, call upon CF&I metallurgists and engineers for assistance... they're always available to help you obtain the most from your grinding media.

CF&I PRODUCTS FOR THE MINING INDUSTRY

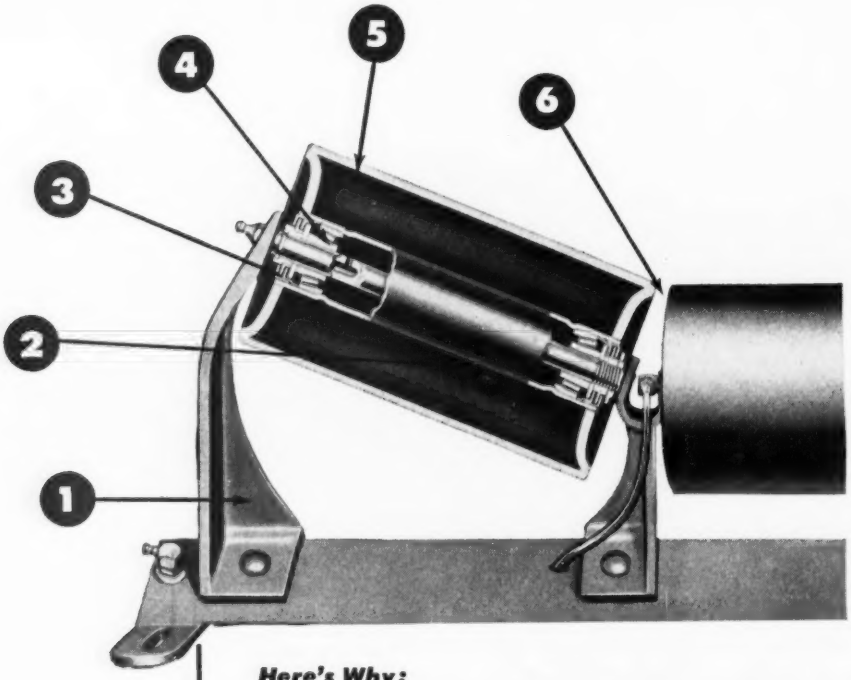
Cal-Wic Wire Cloth Screens • Grinding Balls
Wickwire Rope • Mine Rails and Accessories
Grinding Rods • Rock Bolts

THE CALIFORNIA WIRE CLOTH CORPORATION • OAKLAND
THE COLORADO FUEL AND IRON CORPORATION • DENVER and NEW YORK

CF&I

FORGED STEEL GRINDING BALLS
THE COLORADO FUEL AND IRON CORPORATION

make sure you get full value for your belt conveying dollar



When you're figuring the cost of moving material by belt conveyor, it's important to remember that the belt idler, more than any other item of equipment, determines how low the ultimate cost per ton of material handled will be. Power consumption, belt life, maintenance costs, steady production flow, are all largely dependent on the ability of the idlers to keep rolling.

To make sure you get the most for your belt conveying dollars, you'll find it pays to standardize on Rex® Belt Conveyor Idlers.

Here's Why:

1. **The supporting brackets are unbreakable in normal operation. They remain rigidly tight and will stand abnormal usage without breaking.**
2. **The bearing mountings maintain positive bearing alignment under all conditions.**
3. **Rex Idlers have positive and permanent bearing protection against dust and dirt, and require minimum service attention . . . once every 1000 hours in normal operation.**
4. **Rex Idlers have high grade, precision, antifriction bearings with ample radial and thrust load capacity. This means lowest power consumption under all conditions.**
5. **The roll shells are of permanent unit construction with no joints to loosen or corrode. No replacements until idler is completely worn out.**
6. **The idler rolls are smooth and concentric and spaced in the idler assembly to protect the underside of the belt. The roll units are interchangeable for easy servicing.**

If your idlers have all these features, you're getting the most for your idler dollar . . . you're using Rex Idlers. If you're using any other idler, it can't possibly have all these outstanding features . . . you can't be getting lowest possible cost per ton handled on your belt conveyor.

So, if you haven't yet standardized on Rex Idlers, call your nearest Chain Belt Field Sales Engineer. He'll give you all the details. Or, if you prefer, write for Bulletin 51-81. Chain Belt Co., 4679 W. Greenfield Ave., Milwaukee 1, Wis.

CHAIN BELT REX COMPANY ®

Chain Belt COMPANY OF MILWAUKEE

Atlanta • Baltimore • Birmingham • Boston • Buffalo • Chicago • Cincinnati • Cleveland • Dallas • Denver • Detroit • El Paso • Houston Indianapolis • Jacksonville • Kansas City • Los Angeles • Louisville • Midland, Texas • Milwaukee • Minneapolis • New York • Philadelphia Pittsburgh • Portland, Oregon • Springfield, Mass. • St. Louis • Salt Lake City • San Francisco • Seattle • Tulsa • Worcester

Distributors in principal cities in the United States and abroad.

People *will talk*

開密克幫我們發展工業。
"Chemico helped us develop our industry"

"Chemico" heeft ons meer gegeven dan wij verwachtten.
"Chemico gave us more than we expected"

"كيميكو" رتبه
"It's designed by Chemico"

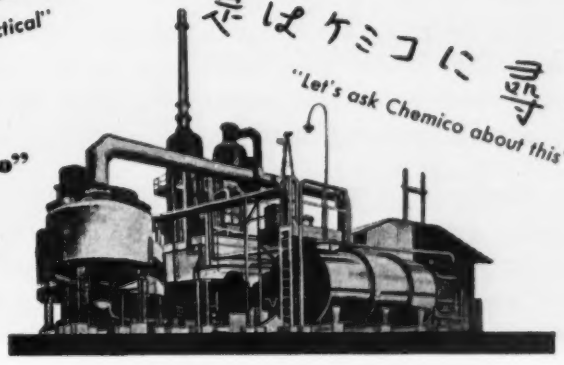
"केमिको" ने सारा काम किया।
"Chemico did the whole job"

"Chemico" comprend nos problèmes.
"Chemico understands our problems"

"CHEMICO" SABE SE É PRÁTICO.
"Chemico knows whether it's practical"

ケミコに尋ねよう!
"Let's ask Chemico about this"

La reputación de "Chemico" nos ha persuadido.
"Chemico's reputation sold us"



When our representatives travel to the far corners of the earth, they find that word of Chemico's activities has gone before them.

Yes, people *will* talk . . . and carry the news of Chemico accomplishments in the design and construction of plants for the production of heavy chemicals: fertilizers for India, Mexico, the Philippine Islands and Egypt; sulfuric acid for Canada, England, Formosa and Brazil; urea for Japan; sulfur recovery for Colombia; pickle liquor recovery for the Union of South Africa, to name a few. And naturally these are in addition to numerous large-scale projects in the United States.

Chemico has created, designed and erected more than 800 installations during the past 37 years that have given people much to talk about. That's why "Discuss it with Chemico" has become a byword of those who need new facilities or additional plant capacity to meet the world's ever-expanding heavy chemical needs.

CHEMICAL CONSTRUCTION CORPORATION

A UNIT OF AMERICAN CYANAMID COMPANY

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CABLES: CHEMICONST, NEW YORK

TECHNICAL REPRESENTATIVES: CYANAMID PRODUCTS LTD., LONDON • CHEMICAL CONSTRUCTION (INTER-AMERICAN) LTD., TORONTO • SOUTH AFRICA CYANAMID (PTY) LTD., JOHANNESBURG

CHEMICO
CHEMICAL CONSTRUCTION CORP.

Chemico plants are profitable investments

CC-338

As with every other product, there can be weakling cables and robust cables. Weakling cables are those that can be classified as having anemia of the insulation. In other words, they do not have the insulation stamina to stand up under the electrical and physical conditions to which they will be subjected. It's this kind of cable that will haunt you.

Simplex-ANHYDREX XX Cables come from a robust family. They have a guaranteed water absorption of only 15 milligrams of water when tested in accordance with U.S.C.G. specifications. They will not crack when exposed to severe ozone conditions. Simplex Anhydrex XX insulation is so robust that it will withstand these tests before or AFTER the insulation has been aged for 7 days at 250°F. (121°C.). Simplex-ANHYDREX XX Cables are recommended for operation at copper temperatures up to 176°F. (80°C.) in either wet or dry locations.

Here is an insulation that doesn't ask for special favors. It's the kind of insulation you should have on your important feeder, network, and station cables that operate in the voltage range of 2,000 to 17,000 volts. These cables won't haunt you.

Want to know more about this robust insulation? Simply send your request to the address below.

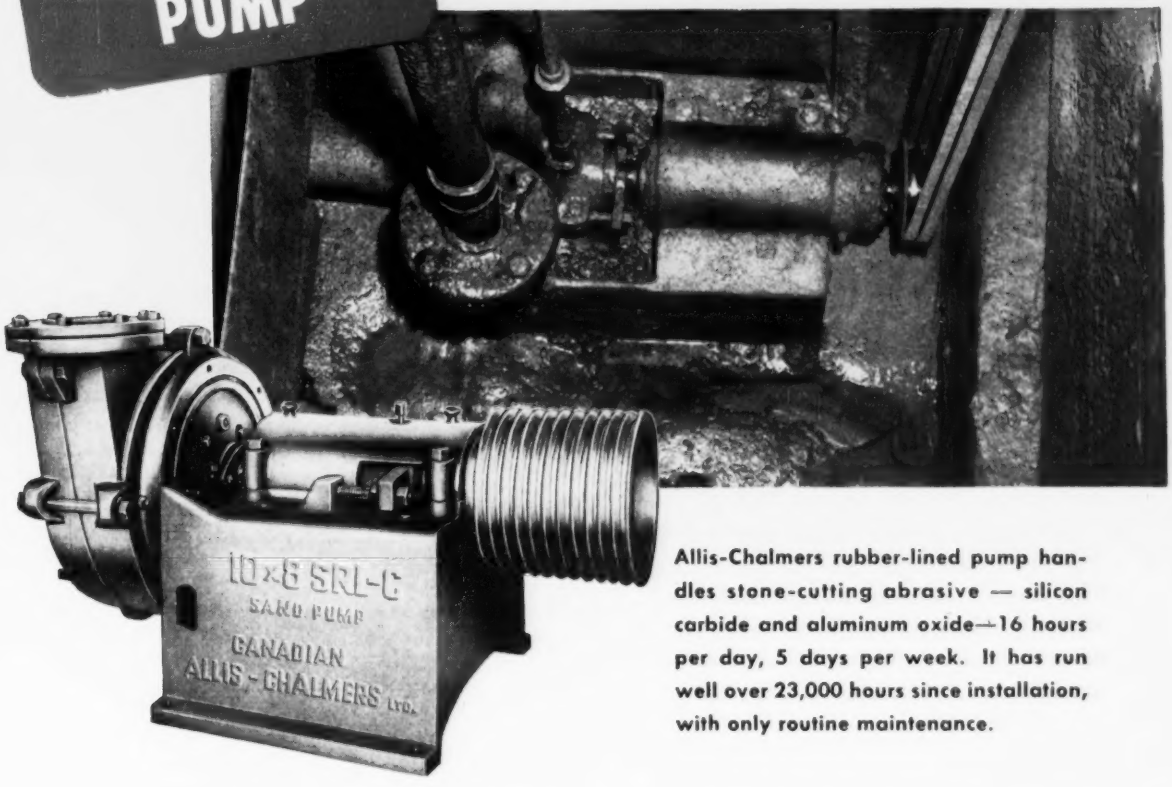
SIMPLEX-ANHYDREX XX

SIMPLEX WIRE & CABLE CO.
79 Sidney St., Cambridge 39, Mass.

. . . OVER 23,000 HOURS and still running!

(Best Previous Pump — 1040 Hours)

ALLIS-CHALMERS RUBBER-LINED PUMP



Allis-Chalmers rubber-lined pump handles stone-cutting abrasive — silicon carbide and aluminum oxide—16 hours per day, 5 days per week. It has run well over 23,000 hours since installation, with only routine maintenance.

PUMPING RECORDS like this are not unusual with the Allis-Chalmers rubber-lined pump. Service life up to 50 times that of the best alloy pumps is common. Pumping costs are greatly reduced because of reduced maintenance and repair costs and also because of fewer production interruptions and less lost production time.

Unique Lining Method

The rubber lining of the Allis-Chalmers SRL rubber-lined pump is bonded to a heavy steel skeleton which is bolted into the casing. This arrangement provides maximum support for the liners but makes them easy to remove when it is found necessary.

Each Installation Specially Engineered

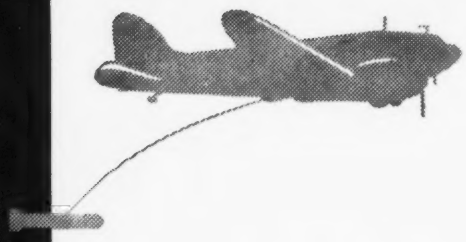
Every pump is individually engineered to provide the best possible performance for the application involved. Special rubber linings of various compounds handle a wide variety of slurries at low cost per gallon pumped.

If you are handling sand, taconite, grinding mill discharge, tailings or any other abrasive slime or slurry and want longer pump life, see your Allis-Chalmers representative. Or write Allis-Chalmers, Milwaukee 1, Wis., and ask for Bulletin 08B7311.

A-3953

ALLIS-CHALMERS

WHAT IS THE DIFFERENCE IN MAGNETOMETER SURVEYS?



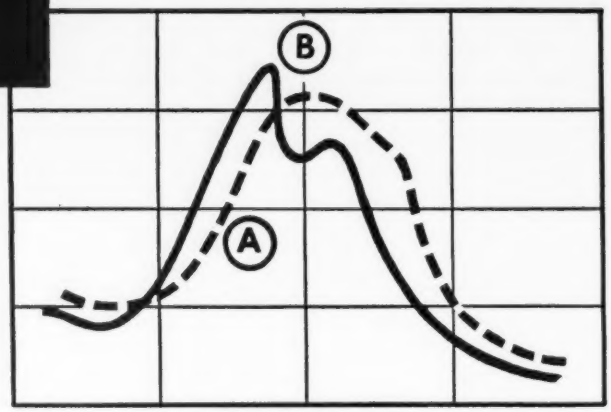
The basic accuracy of any airborne magnetometer survey depends first on the record. Only with a complete, exact magnetic record can you make a valid appraisal of an ore body's size, shape and depth.

Since most magnetometer surveys are flown at 150 to 200 ft. per second, you must have split-second response from the magnetometer. Otherwise, you get a rounded-off, mushy record. To get a significant, complex figure, the recorder must be able to sweep rapidly over a range of thousands of gamma.

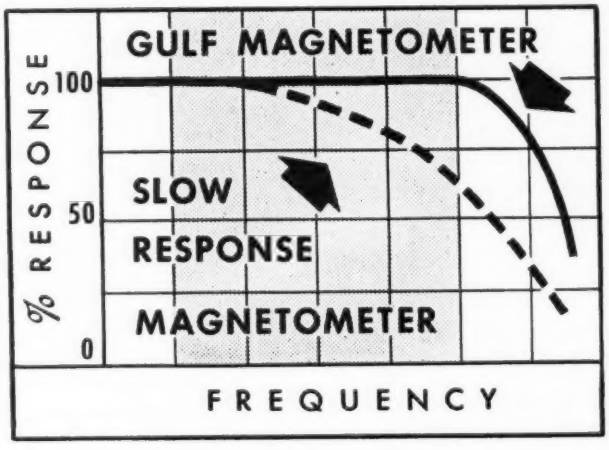
Characteristics of the airborne magnetometer can be expressed simply in a response curve, as shown in the chart at the lower right. Important components of signals found in most mineral surveys fall within the shaded area. Some magnetometers fall off badly here in their response to rapid changes of field. But even in higher frequency ranges, the Gulf Magnetometer's response has great fidelity. With the Gulf Magnetometer, AERO delivers the full record—no mushing or diluting. And sweeping shifts in magnetic intensity are often guideposts to important new finds.

The pay-off difference in AERO's magnetic surveys was proved at Allard Lake, at Morgantown, and at other new finds of magnetite, asbestos, ilmenite, chrome, and other minerals.

You're mapping for the complete record. Why not get it – with AERO's 500,000 miles of aerial exploration experience?



A slow response magnetometer produces a mushy, inadequate record, as in Curve A. The high sensitivity Gulf Magnetometer delivers a full, significant record, as in Curve B.



Some magnetometers fall off in response within important frequency ranges. The Gulf Magnetometer maintains fidelity throughout.

AERO
SERVICE CORPORATION
PHILADELPHIA 20, PENNSYLVANIA
Oldest Flying Corporation in the World

AIRBORNE MAGNETOMETER SURVEYS
PLANIMETRIC MAPS
PRECISE AERIAL MOSAICS
TOPOGRAPHIC MAPS
COLOR PHOTOGRAPHY
RELIEF MODELS

In Canada, our affiliate is CANADIAN AERO SERVICE, LTD., *Ottawa*

WORM GEARING—universal in its application—affords advantages for almost every power transmission job. Whether you want worm gearing sets or speed reducer units, you will find drives to meet your need in the complete Cleveland line.

Vickers Inc. hydraulic winch in operation on a Piasecki Hup-1 helicopter. Inset at left shows built-in Cleveland worm gearing.

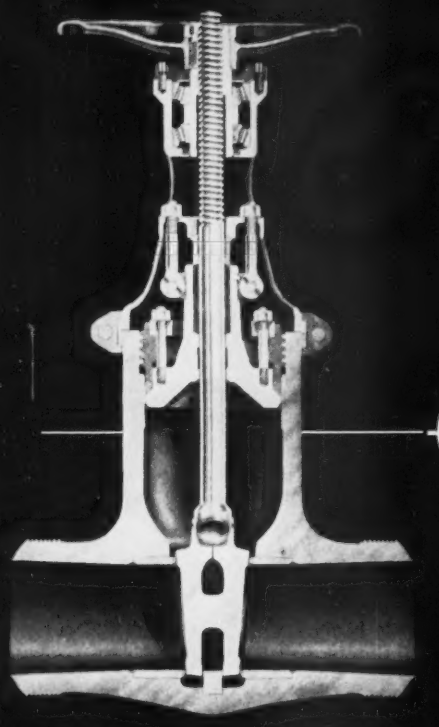
Small Cleveland gearing speeds sea rescue

CLEVELAND worm gearing now has a part in a new kind of sea rescue. Just after the war, for the first time, a Vickers hydraulically-operated winch mounted on a helicopter hoisted two men to safety when an oil barge ran aground. Now use of the winch is standard practice, replacing hard-to-climb rope ladders previously used.

Vickers Inc. chose Cleveland worm gearing to drive the winch because it is small enough and light enough to satisfy rigid weight and bulk restrictions and is capable of governing efficiently sudden stops and starts and changes of direction involved in rescue work. To date Cleveland worm gearing has participated in over 1700 Korean missions.

Cleveland manufactures worm gearing and worm gear speed reducers in a wide range of types and sizes, large and small, to meet the requirements of any machinery builder or user. Write today for Catalog 400. The Cleveland Worm and Gear Company, 3281 East 80th Street, Cleveland 4, Ohio.

Affiliate: The Farval Corporation, Centralized Systems of Lubrication. In Canada: Peacock Brothers, Limited.



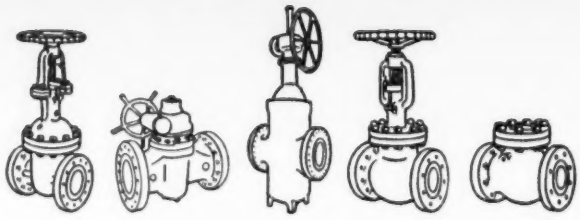
STEEL

COMPLETE LINES OF CAST STEEL VALVES AND PIPE FITTINGS are manufactured by Walworth in a variety of pressure classes, types, sizes, and patterns for general industrial use. Walworth also manufactures cast steel valves for specific service applications.

Walworth produces steel bar stock valves, and cast steel valves made of carbon steel, carbon molybdenum steel, corrosion-resistant, and heat-resistant alloy steels. Included are gate, globe, angle, check, and lubricated plug types. Sizes range from ⅛ to 30 inches; pressures range up to 5,000 psi. Full information is contained in Walworth General Catalog 52, a copy of which will be forwarded if requested on business letterhead.

Walworth also manufactures complete lines of valves and fittings made of bronze, iron, and special alloys as well as steel. Walworth-made valves, fittings, and pipe wrenches total approximately 50,000 items.

Walworth engineers will be glad to help you with your problems. For full information, call your local Walworth distributor, nearest Walworth sales office, or write to Walworth Company, General Offices, 60 East 42nd Street, New York 17, New York.



Illustrated in section is an 8-inch Series 900, Walworth Pressure-Seal Cast Steel Gate Valve designed for high-pressure, high-temperature service. Pressure-Seal Valves are available in Series 600, 900, 1500 and 2500; sizes 1 to 16 inches. Small Cast Steel Valves, Series 1500, in angle and Y-globe types, are also available in sizes ranging from ¼ to 2 inches.

WALWORTH

Manufacturers since 1842

valves . . . pipe fittings . . . pipe wrenches

60 East 42nd Street, New York 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

in WIRE ROPE, too, survival calls for the RIGHT KIND of muscle

Powerful, constrictive muscles give the python the crushing strength that enables him to exist under the grim rules of jungle law—where only the fittest survive.

Same way with wire rope. Here again, ability to last under adverse conditions demands the right kind of muscle. Bending Fatigue . . . Shock Stress . . . Abrasion . . . Load Strain—each demands wire rope that best combines the required resistance factors to overcome the destructive forces encountered in different types of service.

Complete quality control from ore to finished rope; long experience and specialized know-how — these are your assurance that in Wickwire Rope you always get the right construction . . . the right grade of steel and size of wire for long-lasting reliable service on your particular job.

See your Wickwire Rope distributor or contact our nearest sales office.

THE COLORADO FUEL AND IRON CORPORATION—Abilene (Tex.) • Denver • Houston • Odessa (Tex.) • Phoenix • Salt Lake City • Tulsa
THE CALIFORNIA WIRE CLOTH CORPORATION—Los Angeles • Oakland • Portland • San Francisco • Seattle • Spokane
WICKWIRE SPENCER STEEL DIVISION—Boston • Buffalo • Chattanooga • Chicago • Detroit • Emlenton (Pa.) • New York • Philadelphia

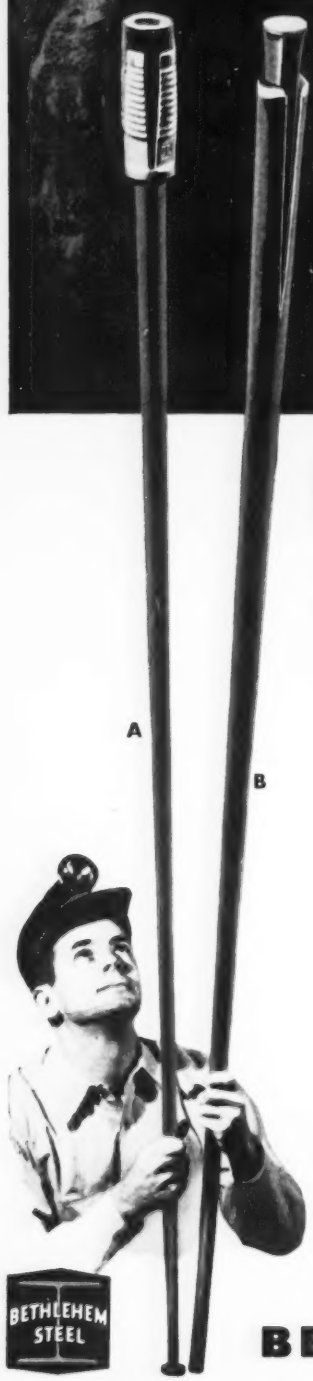
WICKWIRE ROPE
A CF&I PRODUCT

A YELLOW TRIANGLE ON THE REEL IDENTIFIES WICKWIRE ROPE

WICKWIRE ROPE

CF&I

PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION



Roof Bolting Promotes Safety ...Helps Increase Production

Your mine becomes a safer place when roof bolting is used. That is because roof bolting minimizes the need for timbers, and because the bolts consolidate layers of strata into a thick beam, preventing sagging.

Roof bolting helps increase production, too, as loading machines can clean from rib to rib without need for hand-shoveling. It also offers these other advantages: (1) increased economy, (2) faster haulage, (3) greater side clearances, and (4) improved ventilation.

To help mine operators obtain these ideal conditions, Bethlehem manufactures two kinds of roof bolts—the square-head type and the slotted type. Each bolt has its proper application, depending on the kind of roof encountered. For complete information about roof bolts, please write to us at Bethlehem, Pa.

A. SQUARE-HEAD ROOF BOLT

(With Expansion Shell)

An assembly, consisting of unchamfered square-head rolled-thread ⅞-in. bolt, and expansion shell. Two pressed ears on bolt shank support shell during anchoring. Plug is forced into shell when bolt is tightened, expanding leaves of shell to provide holding-tension. Sharp projections on leaves lock against sides of hole, to prevent shell from turning when bolt is rotated. Recommended hole size, 1⅛ in.

B. SLOTTED ROOF BOLT

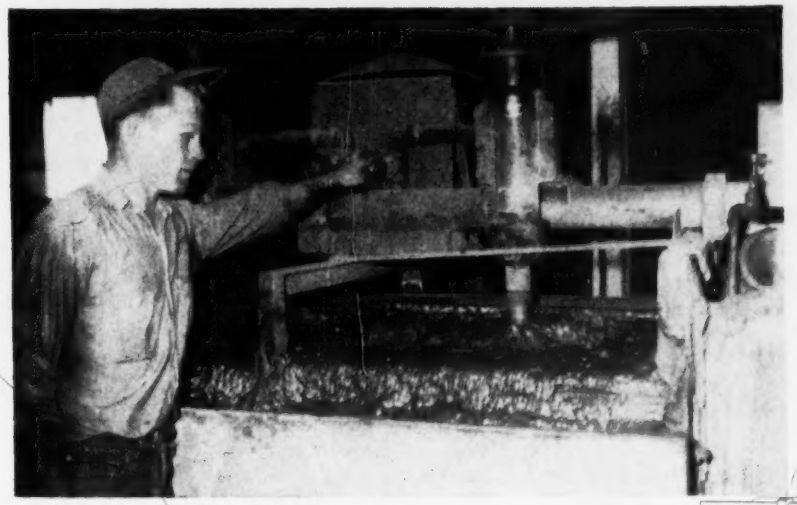
Has forged slot, centered by exclusive process which forms the equivalent of two half-rounds. Slot accommodates wedge. Opposite end of bolt has 5 in. of 1-in. rolled threads. When driven against back of hole, wedge is forced deep into slot, expanding ends of bolt to provide tight grip. Comes with truncated cone point, and American Standard Regular Square Nut. Recommended hole size, 1¼ in.

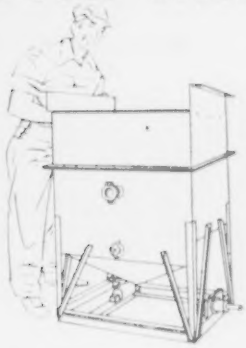
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM MINE ROOF BOLTS

AGITAIR *flotation*
Used in Complex Tungsten Mill





Agitair Flotation in Ima Mill
Patterson, Idaho

HELPS HOLD THE LINE ON COSTS

Recovering vital tungsten at the Ima operation is one of the toughest concentration jobs known to metallurgy. The flowsheet indicates four complex procedures: Jigging, Flotation, Tabling and Magnetic Separation. The flotation step is efficiently handled by a battery of No. 36 Agitair cells, which **not only cleanly separates the sulphide minerals tetrahedrite and chalcopyrite from the tungsten concentrates but also concentrates them into a valuable saleable concentrate.** This step helps make the Ima tungsten concentrates the highest grade with the lowest impurities in the United States. Once again Agitair meets the specification where the going is tough and where every process is vital to profitable operation. We are proud that Agitair was chosen by the Ima Mill — one of the very few domestic mills that could continue to produce tungsten during the period of slack demand and low prices in early 1950.

Write for full details on Agitair Flotation and the Galigher ore testing service.

Leaders In Experience and Service

HOME OFFICE
545 West 8th South
Salt Lake City, Utah
P. O. Box 209

EASTERN OFFICE
921 Bergen Avenue
Jersey City, New Jersey

Agents In All Principal
Foreign Mining Districts

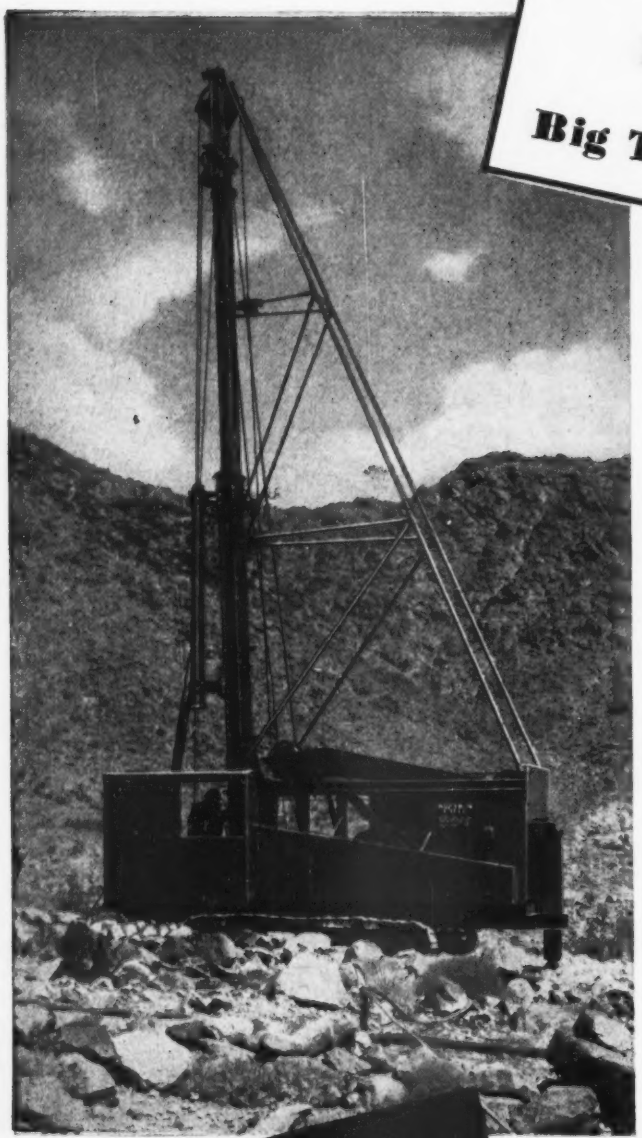
THE GALIGHER CO.

METALLURGICAL DIVISION
THE GALIGHER COMPANY
ENGINEERING SERVICE

CONSULTATION • ORE TESTING
PLANT DESIGN • GEOLOGIC INVESTIGATION

New BUCYRUS-ERIE 50-T

Big Time Rig for Big Time Operations



Handles 6,000 lbs. of tools
Drills 9" to 12" holes

HERE'S the largest capacity, mobile churn-type blast hole drill on the market today. It's the new Bucyrus-Erie 50-T, successor to the well-known 42-T used and preferred by mining companies the world over for the past 16 years. The new 50-T gives you all of the popular advantages of its predecessor plus many improvements based on Bucyrus-Erie's unequalled experience in manufacturing blast hole drills. Some features that make the 50-T stand out are:

NEW TUBULAR TYPE TOOL GUIDE steadies and guides the tools when a new hole is started, enabling the operator to run drill at maximum speed from the very start of the drilling operation. Guide opening and closing is hydraulically controlled.

HYDRAULIC LEVELING JACKS, two at the drilling end and one at the power unit end, make leveling fast and easy. Jacks are 5½ inches in diameter and have a 36-in. maximum travel. Jack supports are an integral part of the drill frame.

NEW HEAVIER DERRICK MEMBERS to give you all the derrick strength needed to meet toughest drilling conditions. Lower section has 10-in., 15.3 lb. channels; upper section 9-in., 13.4 lb. channels.

POWER DRIVEN TOOL WRENCH, built into the operator's platform, makes easy work of setting up or loosening tool joints. Proper pressure for tightening up tool joints is determined by means of a hydraulic torque indicator.

Write for complete information. You'll be convinced that the new, powerful 50-T can make money for you!

2853C

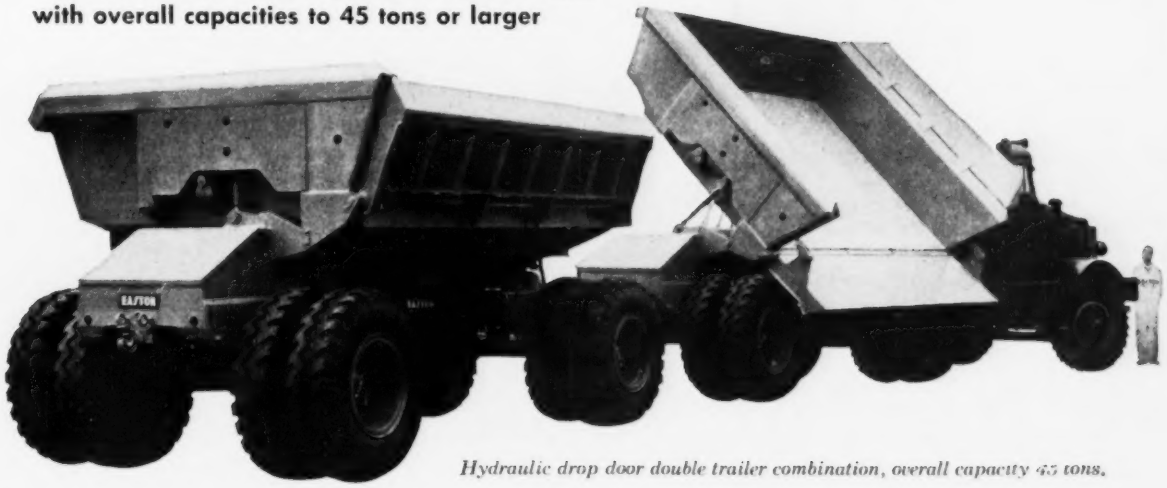
BUCYRUS ERIE
SOUTH MILWAUKEE
WISCONSIN

Standard units used separately or in combination

Here's New Flexibility

to meet varying haulage requirements

Double-trailer or truck-and-trailer combinations with overall capacities to 45 tons or larger



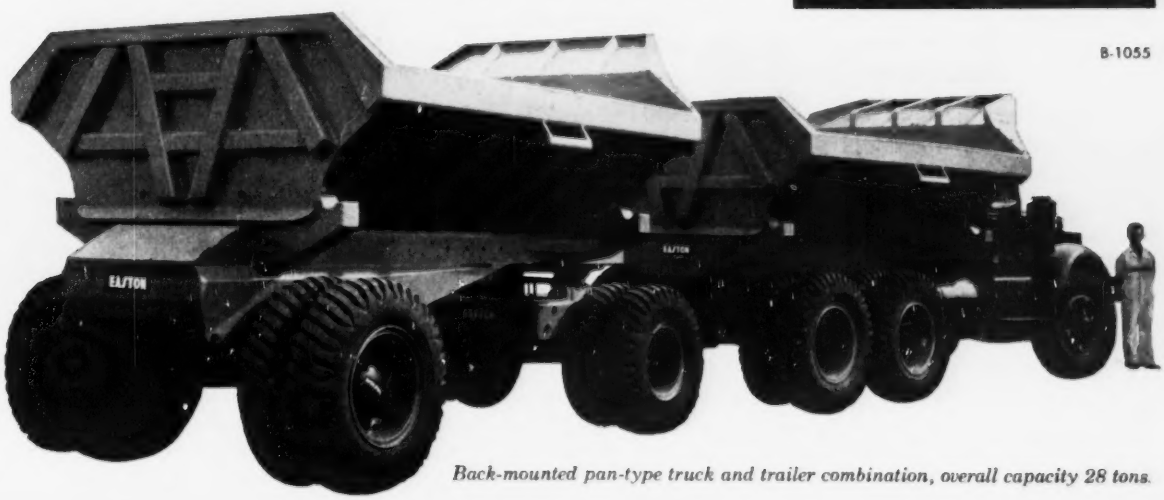
Hydraulic drop door double trailer combination, overall capacity 45 tons.

BIG EASTON COMBINATIONS are designed to provide flexibility where haulage requirements are subject to change. Changes in required tonnage, changes in haulage distance, changes in the type of material handled, changes in grades and road conditions, changes from job to job . . . these and similar developments can often be met quickly and efficiently, simply by coupling or uncoupling the converter dolly and rear trailer. The single or combination unit goes right to work with no time wasted. Also, for the big payloads to 45 tons and over, there's no need to experiment with costly, untried equipment when EASTON combinations provide the rugged, rock-proved dependability of standard EASTON body and trailer design. These big combinations offer a choice of several types and capacities for service with all makes of heavy duty off-highway trucks and tractors. Ask your local off-highway truck salesman for complete information, or write directly to EASTON.

EASTON CAR & CONSTRUCTION COMPANY • EASTON, PA.

EASTON

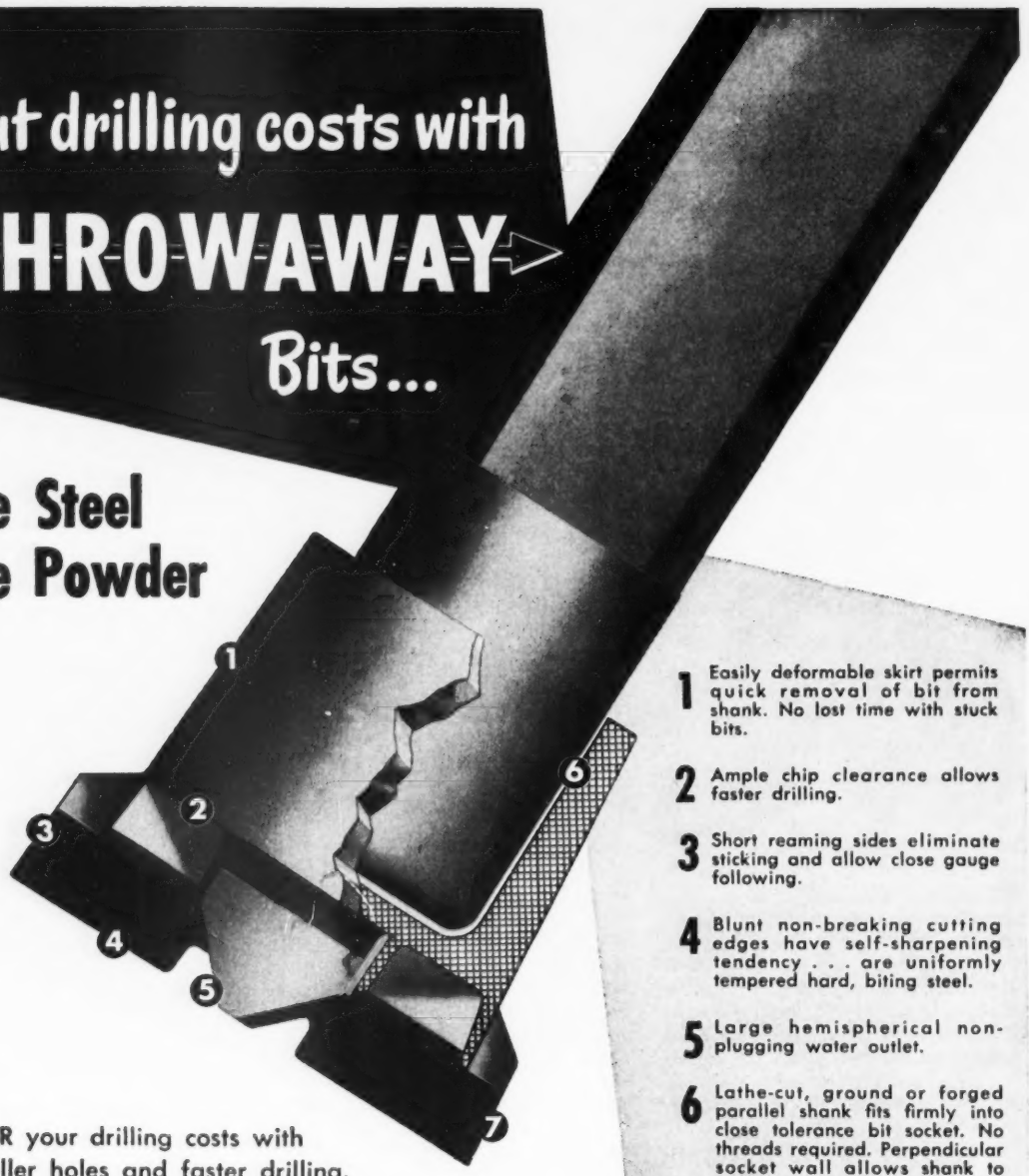
B-1055



Back-mounted pan-type truck and trailer combination, overall capacity 28 tons.

Cut drilling costs with THROWAWAY Bits...

Save Steel
Save Powder



1 Easily deformable skirt permits quick removal of bit from shank. No lost time with stuck bits.

2 Ample chip clearance allows faster drilling.

3 Short reaming sides eliminate sticking and allow close gauge following.

4 Blunt non-breaking cutting edges have self-sharpening tendency . . . are uniformly tempered hard, biting steel.

5 Large hemispherical non-plugging water outlet.

6 Lathe-cut, ground or forged parallel shank fits firmly into close tolerance bit socket. No threads required. Perpendicular socket wall allows shank to bottom in bit for maximum performance.

7 Perfect uniformly treated bit teeth assure best possible cutting power and smooth operation.

LOWER your drilling costs with smaller holes and faster drilling. Bottom with 1¼ inch holes and save costly steel and powder. Let us prove to you that the man at the drill can do more work for less cost with a Throwaway Bit. Write for new low price list and technical description of Throwaway Bit to: Portland, Oregon home office or distributors listed below. Competent field engineers and dealers are always at your service.

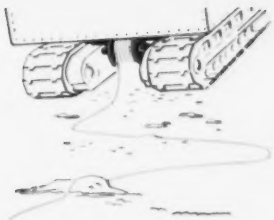
THROWAWAY BIT CORPORATION

4200 N. W. YEON AVENUE., PORTLAND, OREGON

BONNE TERRE FARMING & CATTLE CO
Bonne Terre, Missouri

CREATING ENGINEERING
825 1st National Bank Building
Denver, Colorado

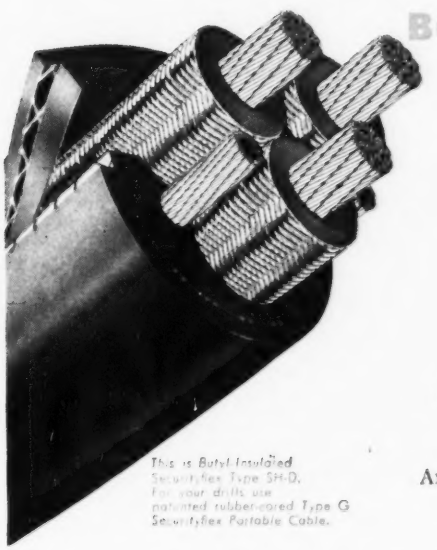
GREENAWALT-WHEELOCK & CO.
415 Mills Building
El Paso, Texas



proved in our mines
for better performance in yours

We—at Anaconda—are miners ourselves. We know shovel cable because we use lots of it. Safety and uninterrupted flow of power are important in any mining operation. In both respects we know Securityflex Type SH-D has a good record.*

for longer "failure-free" service on big shovels, insist on
Butyl-Insulated Securityflex above 2kv



This is Butyl-Insulated Securityflex Type SH-D. For your drills use patented rubber-cored Type G Securityflex Portable Cable.

ANACONDA Securityflex Cable is safer, less liable to "blow-out," easier to work with. Here's why:

BUTYL INSULATION. This accounts for improved resistance to moisture, ozone, heat (up to 80C).

NEOPRENE JACKET. Here is real flexibility and great strength engineered for this specific tough use. Handles well, has high impact resistance and lasts longer in all weather.

RUBBER-CORED GROUND WIRES. This safety-first feature prevents kinking, gives greater shield contact, and cushions the wires.

COPPER-COTTON SHIELD. Special new-type shield makes splicing easier, faster without damage to insulation. Eliminates chafing failures.

Ask your Anaconda Sales Office or Distributor to show you this and other ANACONDA portable mining cables. Learn how continuous improvements have made these famous cables better . . . for safety . . . and for increased production at less cost in your mine. Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

*Trademark 6/3460

the right cable for the job ANACONDA® **wire and cable**

with a

Class Y Compressor

— and only a simple foundation is needed for this exceedingly compact unit.

Shipped intact as a "package" requiring only external connections, the Class Y is easy and inexpensive to install, and may readily be moved, intact, to another location if desired.

Yet it is built for continuous, heavy-duty service, with CP features that assure high efficiency and low maintenance . . . large area Simplate valves . . . multi-step capacity regulation . . . effective inter-cooling . . . precision bearings . . . force-feed lubrication.

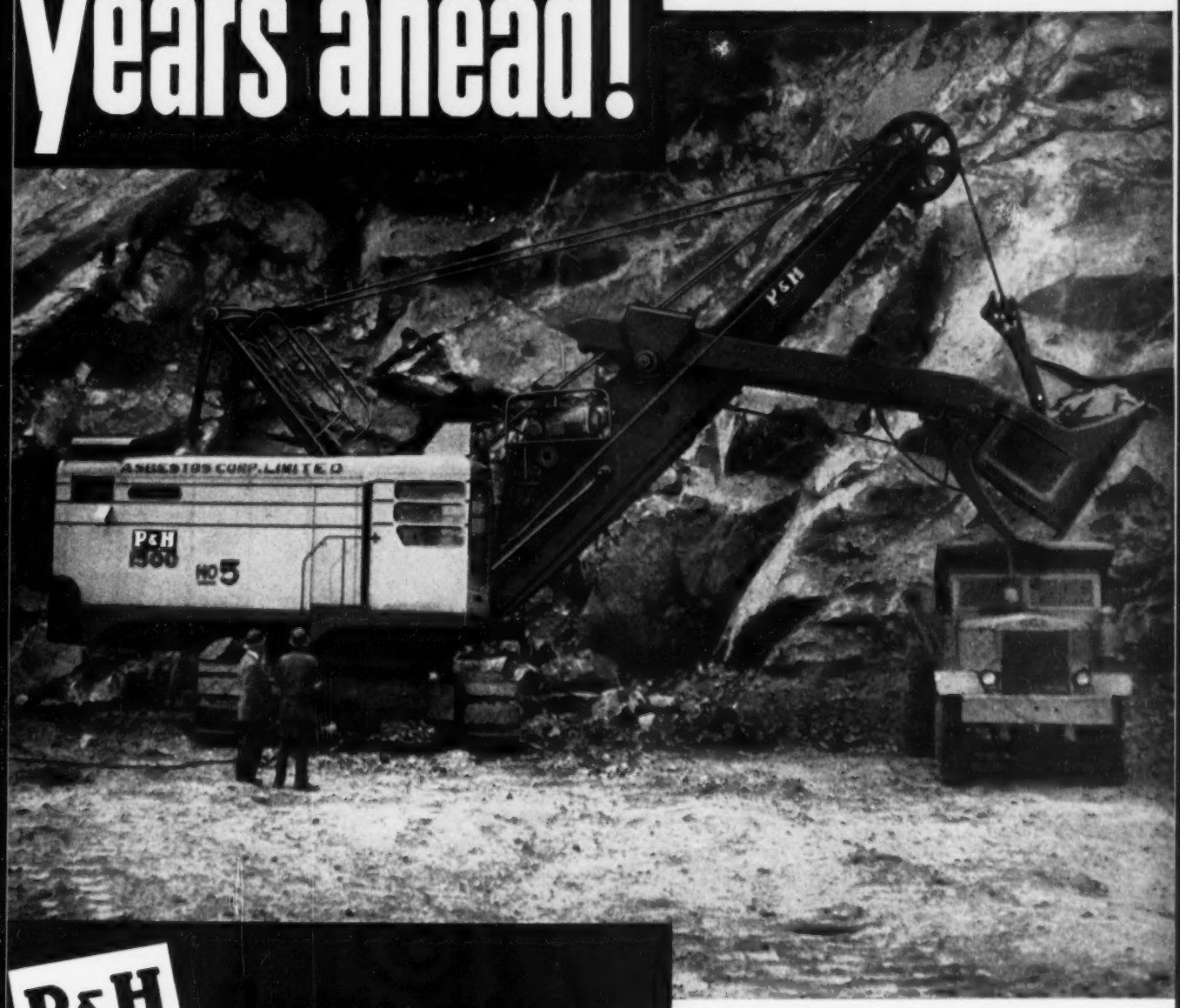
In sizes from 75 hp. to 250 hp., 500 cfm to 1663 cfm; with direct-connected, flange-mounted synchronous or squirrel cage motor. Also available with belted and coupled motors.

Write for Bulletin 766

CHICAGO PNEUMATIC TOOL COMPANY
General Offices: 8 East 44th Street, New York 17, N. Y.

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

years ahead!



P&H

Here's progress far ahead of old fashioned designs — progress that pays off in steadier production . . . lower tonnage costs! For example —

P&H stepless power regulation gives you smoother, more accurate control . . . completely eliminates the complex make-and-break contactors which cause trouble. Furthermore, P&H Magnetorque* Hoist Drive powers hoisting motions electro-magnetically — gives you faster dipper action . . . freedom from maintenance worries.

But P&H progress doesn't stop with electrical advancements. Here's the ruggedness of welded alloy steels — backbone for a lifetime of service. But let us direct you to a P&H in action — see *all* the modern refinements that make P&H the top producer in the open pit.

*T.M. of Harnischfeger Corporation for electro-magnetic type coupling.

Every third P&H Electric Shovel sold is a repeat order

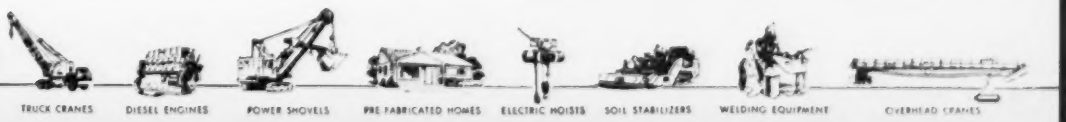
P&H LARGE EXCAVATOR DIVISION

HARNISCHFEGER

CORPORATION

4400 W. NATIONAL AVENUE • MILWAUKEE 46, WISCONSIN

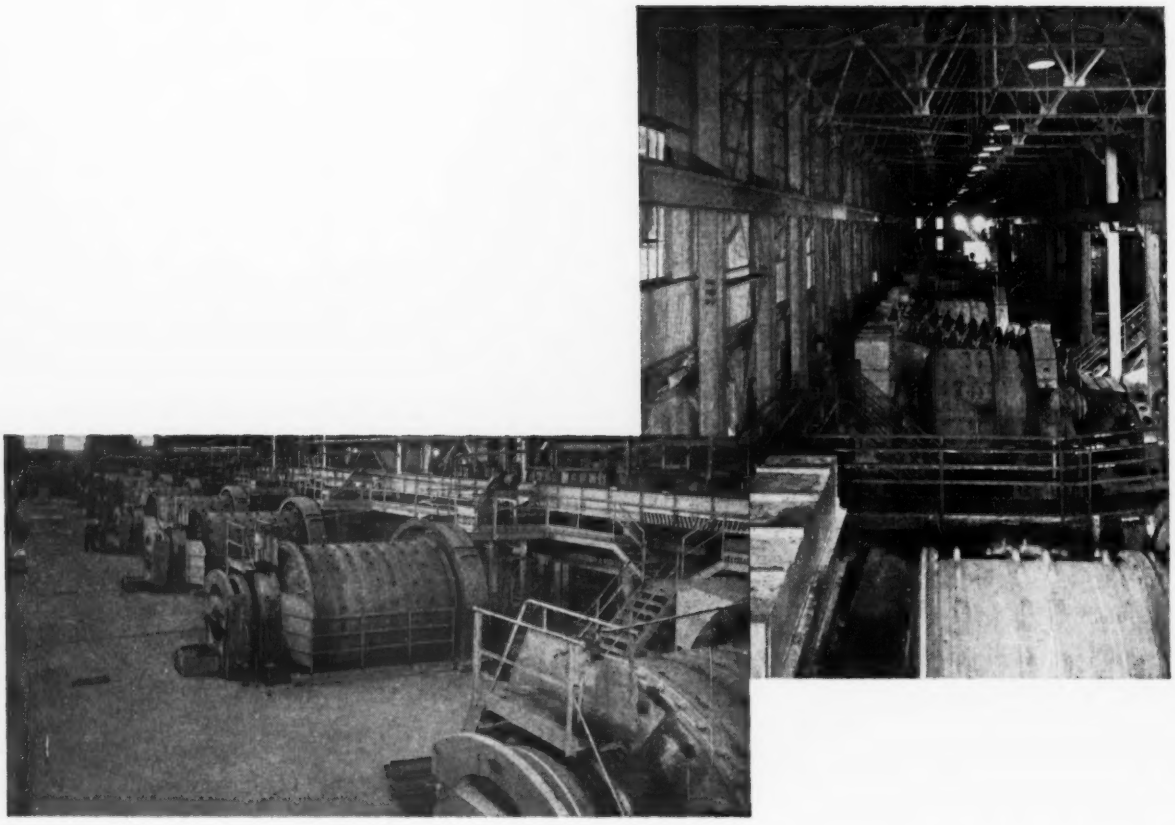
he **P&H** *Line*



TRUCK CRANES · DIESEL ENGINES · POWER SHOVELS · PRE-FABRICATED HOMES · ELECTRIC HOISTS · SOIL STABILIZERS · WELDING EQUIPMENT · OVERHEAD CRANES

A Cost-cutting

• MARCY MILLS



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MASSCO GRIGSBY RUBBER PINCH VALVES
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SKINNER ROASTERS

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team

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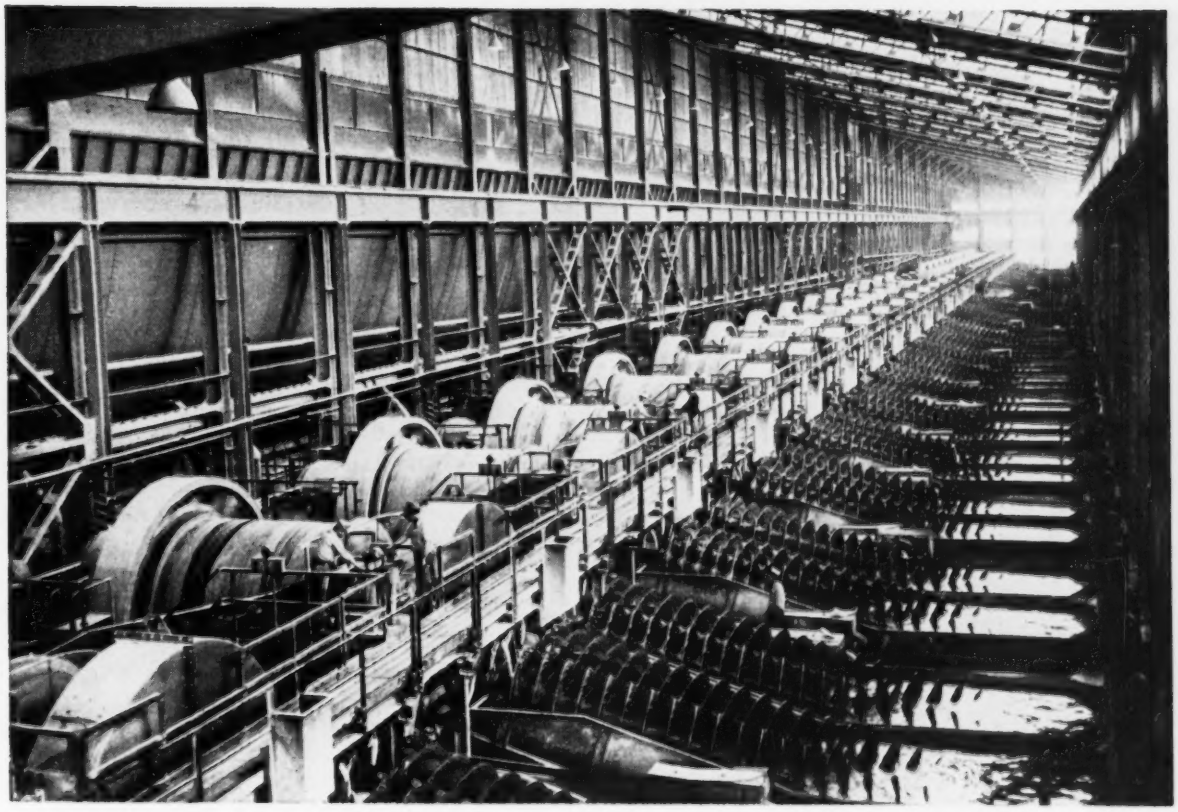
The many successful mining companies thruout the world who continue to place repeat orders for Marcy Ball and Rod Mills and Akins Classifiers prove the low-cost-per-ton performance of these machines.



The Mine & Smelter Supply Co.

Denver 17, Colorado

OFFICES IN SALT LAKE CITY, EL PASO, 1775 BROADWAY, N. Y. C.

Let our engineers show you the proof... actual operating data for all kinds of grinding and classification problems.

AND ITS SUBSIDIARY COMPANY **COLORADO IRON WORKS**

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A Cost-cutting

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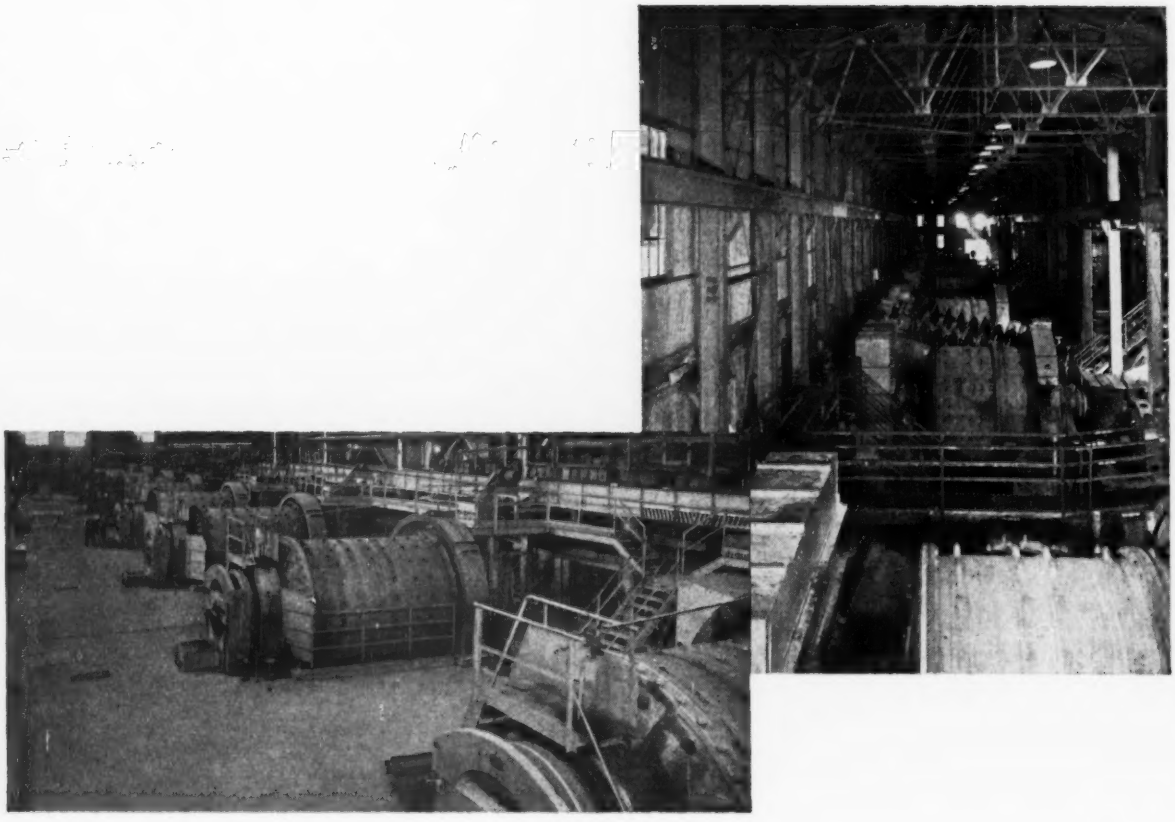

OTHER M&S AND CIW PRODUCTS

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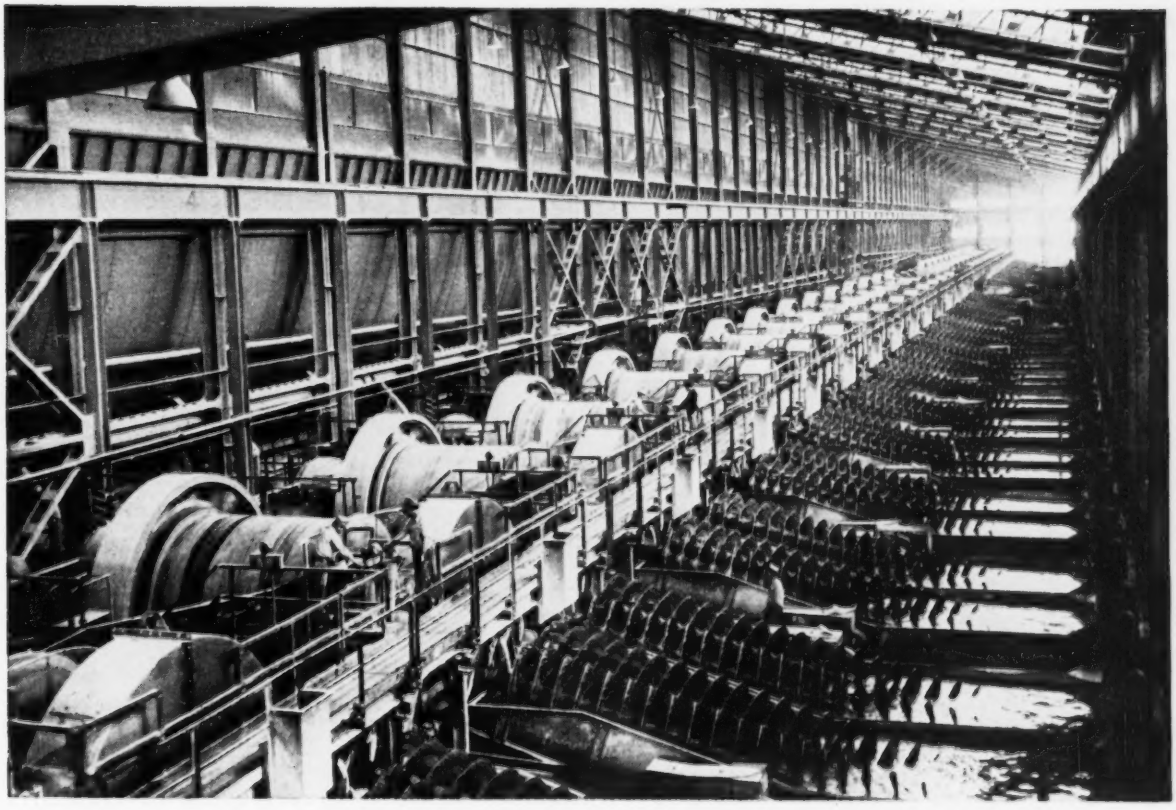

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Let our engineers show you the proof... actual operating data for all kinds of grinding and classification problems.

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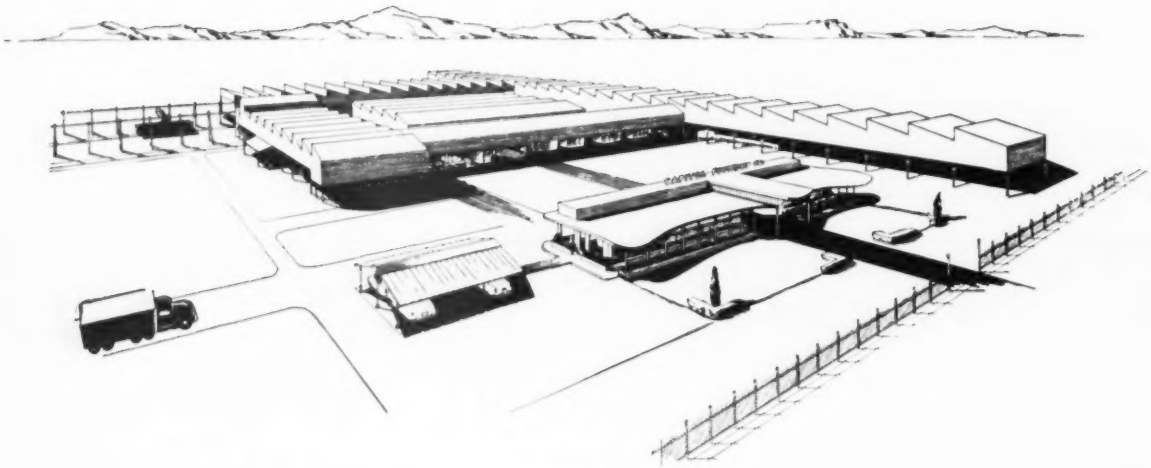
NEW FOUNDRIES

to serve the West...



To BETTER SERVE the expanding mining facilities of the West, the Capitol Foundry Company, subsidiary of National Malleable and Steel Castings Company, will start operating its new plant near Phoenix this year.

First unit of the new plant, which will expand Capitol's production of cast-steel grinding balls, is scheduled to start production in May, 1953.

A second unit will begin operations in December. It will produce Ni-Hard iron, manganese steel, chrome-moly steel, white iron ball mill liners and grates; also general castings of manganese, chrome-moly and carbon steel; gray, white and alloy iron; and bronze.

Both foundries, incorporating all modern mechanical methods, will have capacities capable of producing many products in addition to their present items.

A-6848

BETTER SERVICE TO THE WEST'S EXPANDING MINING INDUSTRY!

for your immediate needs, contact:

CAPITOL FOUNDRY COMPANY,
502 South 15th Avenue, Phoenix, Arizona

ARIZONA IRON WORKS,
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subsidiaries of

NATIONAL MALLEABLE and STEEL CASTINGS COMPANY
Cleveland 6, Ohio

NATIONAL Products FOR TRANSPORTATION AND INDUSTRY

"Here's one place where it pays to be TIGHT!

"Shooting a blast is like jumping with a parachute . . . everything's got to work right the first time, or else!

"And everything depends on the loading and hook-up. You need *tight* connections all along the line, and you get 'em quickly and easily with Primacord.

"For the trunk line, I use Plain Primacord. It ties easily in knots that don't loosen up.

"That square knot is used above ground, when you want to lengthen the trunk line.

"Just remember to *pull it up tight*. You can, with Primacord."

Ask your explosives supplier or write for further facts to

THE ENSIGN-BICKFORD COMPANY
Simsbury, Connecticut
Also Safety Fuse Since 1836

PLAIN PRIMACORD

is very flexible and light in weight. It has a tough textile cover and can be tied up tight without slipping. Use it as the down line in small bore or shallow holes and as the trunk line to connect all holes.

Other PRIMACORD Brands

Reinforced — for deep holes and resistance to abrasion
Wire Countered — for deep ragged holes
Plastic Reinforced — for deep holes and unusual wet conditions.

Use PRIMACORD®

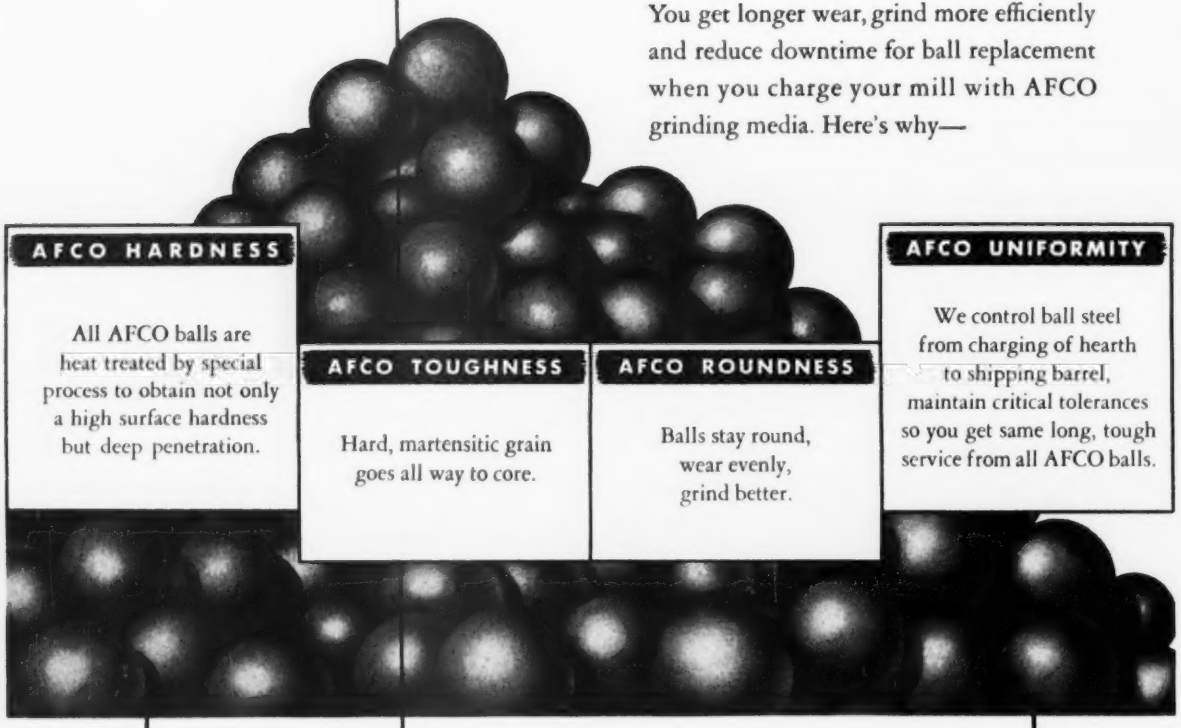
The PROVED and APPROVED DETONATING FUSE

P-2

CUT YOUR GRINDING COSTS WITH AFCO FORGED STEEL BALLS

Choice of Chrome-Moly or Carbon Steel ¾" to 5"

You get longer wear, grind more efficiently and reduce downtime for ball replacement when you charge your mill with AFCO grinding media. Here's why—



AFCO HARDNESS

All AFCO balls are heat treated by special process to obtain not only a high surface hardness but deep penetration.

AFCO TOUGHNESS

Hard, martensitic grain goes all way to core.

AFCO ROUNDNESS

Balls stay round, wear evenly, grind better.

AFCO UNIFORMITY

We control ball steel from charging of hearth to shipping barrel, maintain critical tolerances so you get same long, tough service from all AFCO balls.

see for yourself .....

charge your mill with AFCO balls, compare them with any other ball you've ever used. Write, wire or phone NOW for prices.

AMERICAN FORGE COMPANY

Executive offices and plant: **Niles, California . . . Phone Niles 3311**

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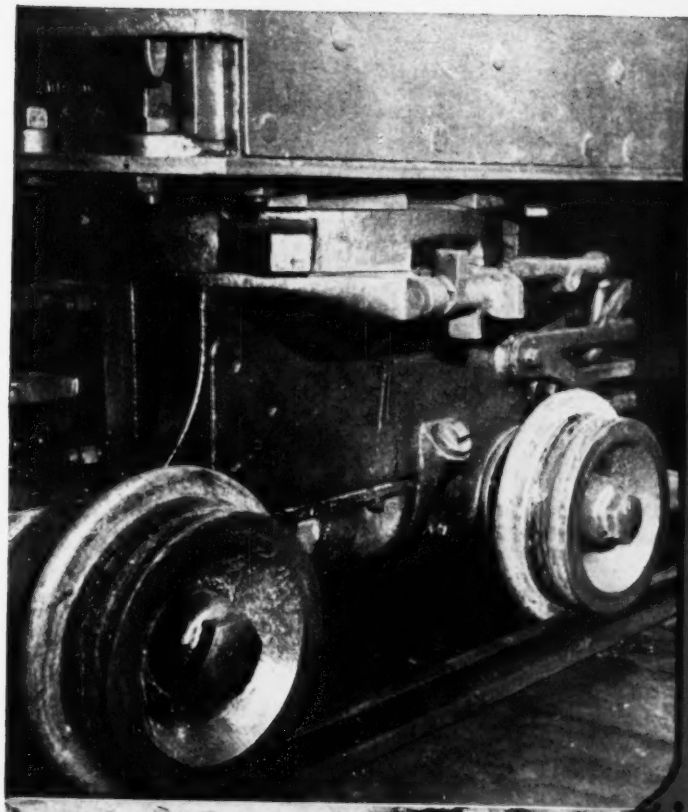
"AFCO" PRODUCTS



hugs the rails...

to hustle your loading

...with safety

Gardner-Denver Mine Car Loaders are fully described in Bulletin MCL. Send for your copy today!

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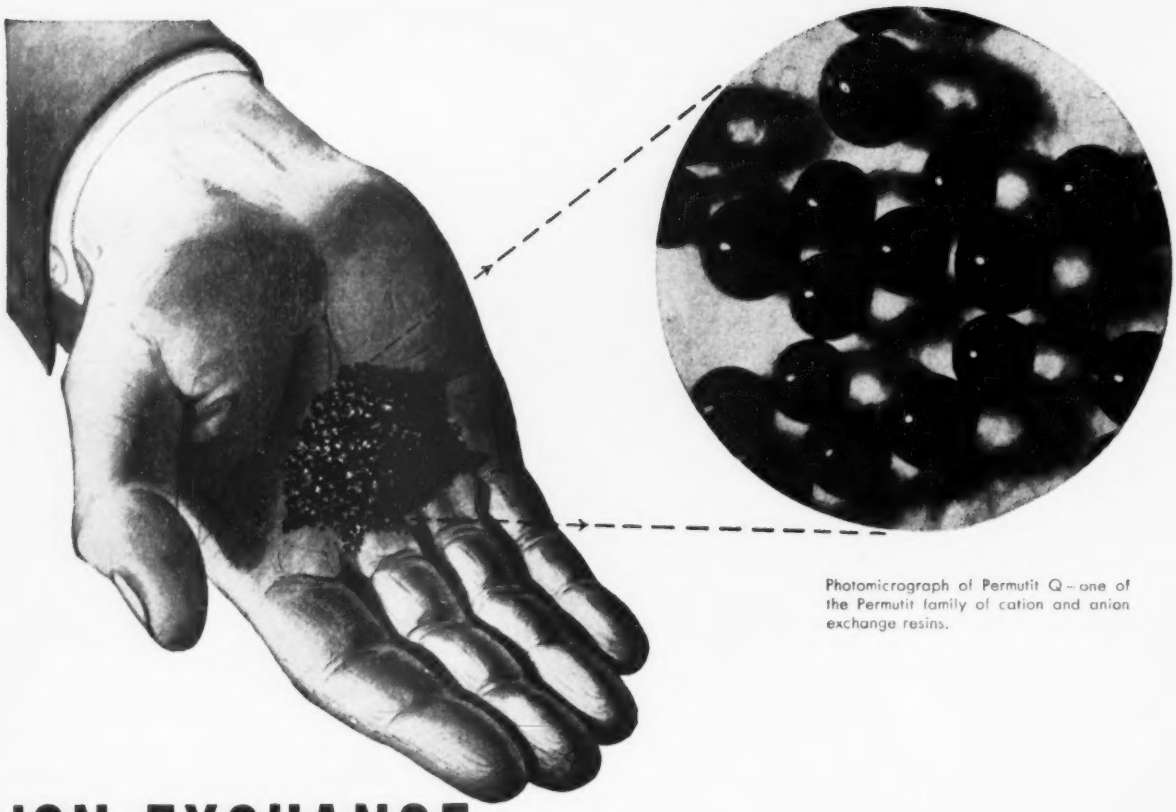
THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS



Photomicrograph of Permutit Q – one of the Permutit family of cation and anion exchange resins.

ION EXCHANGE

—new tool for Wet Process Metallurgy

Have you ever thought of putting ion exchange resins to work . . . of developing new processes that will pave the way to quantity recovery of valuable metals from ores now considered wastes because of the limitations of conventional techniques?

Ion exchange holds great promise of revolutionizing existing methods of concentration, purification and separation. The roster of metals with ores amenable is long and impressive . . . includes copper, tungsten, vanadium, molybdenum, gold and silver.

With over forty years of experience in ion exchange, Permutit has worked on all types of problems. Most of the ion exchange processes now in use were developed, designed, and manufactured by Permutit . . . often in cooperation with the industries which have adopted the processes.

Permutit is ideally equipped to cooperate with your engineers in developing ion exchange techniques to meet your specific requirements. Remember, Permutit is the only manufacturer of all types of ion exchangers . . . both resins and equipment. This assures undivided responsibility for the specification,, design, manufacture and performance of both equipment and resins, tailor-made to your requirements.

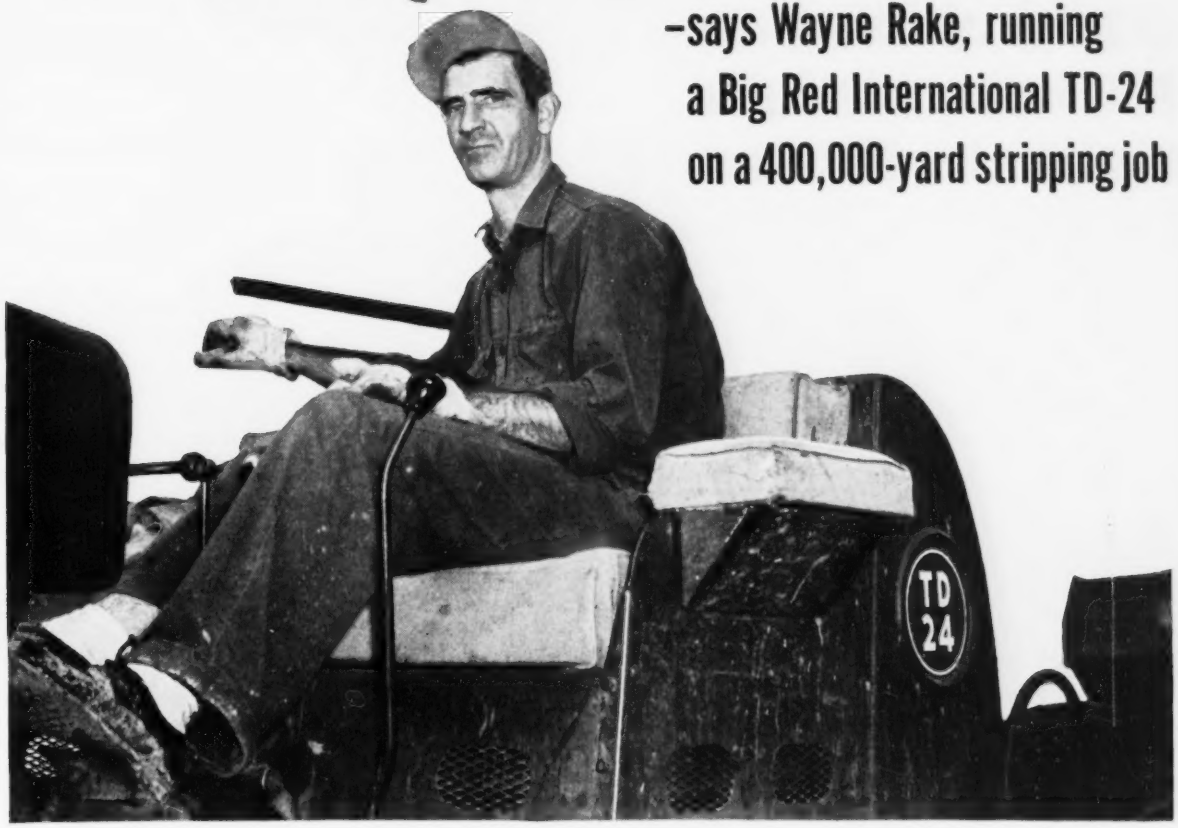
For further information, write to: THE PERMUTIT COMPANY, DEPT. EMS-2, 330 WEST 42ND STREET, NEW YORK 36, NEW YORK; or Permutit Company of Canada, Ltd., 6975 Jeanne Mance St., Montreal.

PERMUTIT®

Ion Exchange and Water Conditioning Headquarters for 40 Years

"It's the Operator's Crawler"

–says Wayne Rake, running a Big Red International TD-24 on a 400,000-yard stripping job



Contractor Hilding Ekdahl of Fort Dodge, Iowa, is working three International TD-24s top speed at a U. S. Gypsum quarry. One hundred feet of waste and overburden covering a 20-foot vein of pure gypsum is being removed.

On substantial earthmoving jobs like this, operators who like their crawlers can make a big difference in the final net profit figure.

Just listen to what one of Ekdahl's operators, Wayne Rake, has to say about his TD-24:

"This TD-24 with its turns with power on both tracks, is the easiest-operating crawler for any skinner. I can load more dirt faster and make the delivery haul quicker than with any other crawler I ever operated. It's definitely an operator's crawler."

For more facts and figures on remarkable TD-24 performance that makes it the operator's pet, see your International Industrial Distributor. You'll be a TD-24 man from then on in!

INTERNATIONAL HARVESTER COMPANY, CHICAGO 1, ILLINOIS

BIGGER PAYLOADS PAY OFF. International TD-24 and scraper strip heaping loads fast to get at pure gypsum underneath.

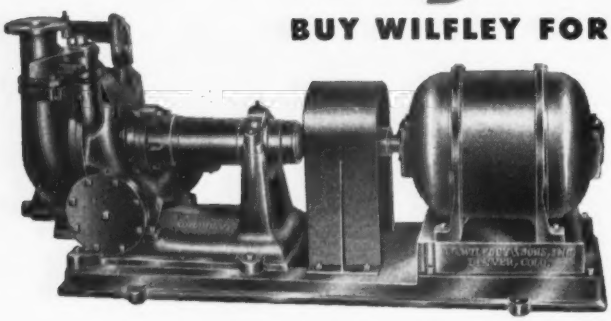
INTERNATIONAL HARVESTER

INTERNATIONAL

POWER THAT PAYS

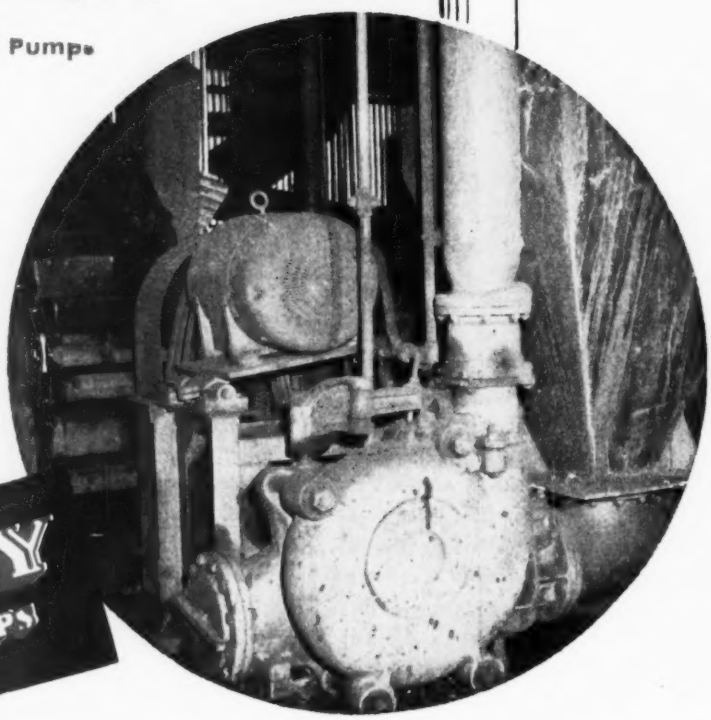
heavy media

BUY WILFLEY FOR COST SAVING PERFORMANCE



Companion to famous Wilfley Acid Pump.

This Wilfley Model K *pump is extremely effective in heavy media circuit and thickener circuit work in coal washing operations. Specifically designed for rugged, heavy duty performance, delivering continuous, trouble-free operation at low cost without media loss, leakage or dilution.*



WILFLEY centrifugal PUMPS

In modern plants all over the world dependable, highly efficient Wilfley pumps are on the job, operating 'round-the-clock without attention. Available in sizes that meet every pumping requirement. Individual engineering on every application... Write or wire for complete details.

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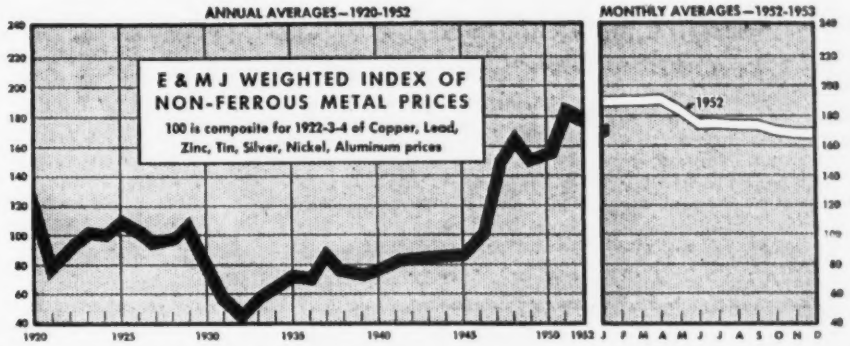
E&MJ OUTLOOK

PRICES


ANNUAL AVERAGES—1920-1952
E & M J WEIGHTED INDEX OF NON-FERROUS METAL PRICES
100 is composite for 1922-3-4 of Copper, Lead, Zinc, Tin, Silver, Nickel, Aluminum prices
MONTHLY AVERAGES—1952-1953
1952

MARKETS

Higher prices during January for foreign silver, aluminum, and nickel were nearly counterbalanced by unsettlement in lead and zinc. Result—*E&MJ's* index of nonferrous metal prices moved up slightly to 172.82 for January from 172.00 for December.

Weakness in London markets for lead and zinc still is a bearish factor in U.S. markets. Consumers seem still to be able to hold their wait-and-see position, but it shouldn't be long until they're forced to buy.

Domestic copper is still strong on the confident expectation of a higher market sooner or later. U.S. purchases, as for some time past, are the main prop of the world copper market.

RFC's decision to purchase Bolivian tin, at unchanged prices, suggests that there's some sort of deal in the making on compensation to the owners of the tin mines Bolivia expropriated recently.

•

AT HOME

Practically everyone in business thinks he's going to do as well in 1953 as he did in 1952, maybe better. We suspect a good bit of this, as in the auto industry, is professional optimism. Business will certainly hold up for the first half, but it's going to be a lot tougher to keep on selling things at the same rate in the second half.

Prices seem headed, if not downward, at least sideways. Zinc and lead must have about reached bottom, and ought to rise before much longer. Copper is still in such short supply that if controls were lifted, its price would shoot up, temporarily at least. It may be several months before normal supply-demand relationships once more rule metal markets.

Uranium turns up again near the Sunshine mine, in the Coeur d'Alene, this time on a nearby Bunker Hill property. The AEC rates it as interesting but not yet of commercial significance.

If, as is likely, Park Utah and Silver King agree to merge, it would mean exploration and operating economies for these old Park City, Utah, lead-zinc producers. A. S. & R., owns about 24% of Silver King's shares; Anaconda has about 23% of Park-Utah.

The need for nickel being what it is, we'd advise prospectors to go look for it. As evidence, examine the deal a new nickel project can get from the DMPA. (See p. 141)

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ABROAD

Despite Bolivia's apparently successful tin mine expropriation, it doesn't look as if such grabs will become widespread. There are indications that raw material-producing small nations, outwardly as nationalistic as ever, will listen to reason in their own interest.

Discovery of base metal ore in New Brunswick drove jittery Canadian speculators in penny stocks wild as January ended. Tremendous tensions are building up among investors everywhere, and it isn't healthy.

MARKETS—Trends and Prices

Lead and Zinc Prices Fail to Hold as London Weakens—OPS Advances Nickel and Aluminum

SPOTTY TRADING CONDITIONS marred the record in nonferrous metals during January. Copper continued to move freely, partly because of the conviction entertained most everywhere that an upward adjustment in the domestic price will take place in the near future. However, lead and zinc didn't do so well, chiefly because of selling pressure that originated outside of this country. Though actual consumption of all metals in this country remained high, buyers exercised great caution whenever price unsettlement came into the picture.

Trading in zinc was resumed on the London Metal Exchange on Jan. 2, and in spite of steps taken to cushion the move because of large stocks in the hands of the government, the trend in prices was downward throughout the month. January zinc declined from £95½ per long ton bid at the closing session on Jan. 2 to £85¼ on Jan. 29.

Price Index Higher

Price fluctuations were more numerous. Higher ceiling prices were allowed on nickel and aluminum. Foreign silver improved its position on smaller offerings and a fairly good demand. Copper was unchanged. Both lead and zinc declined in price in the second half of the month. These conflicting price movements caused the *E&MJ* price index to advance slightly from 172.00 in December to 172.82 in January. In January of 1952 the index stood at 193.83.

Effective Jan. 14, International Nickel announced an increase in the price of nickel of 3½¢ a pound, establishing the quotation at 60¢ (U.S.) f.o.b. Port Colborne, Ont. The quotation includes the U.S. import duty of 1¼¢ a pound. "This adjustment in price has been made," the company said, "as a consequence of the decline in the export price in Canadian currency resulting from the reduced foreign exchange value of the U.S. dollar and other currencies relative to the Canadian dollar, as well as of increased costs."

The Office of Price Stabilization authorized a price increase in primary aluminum of one-half cent a pound, effective Jan. 22. This action was taken shortly after Defense Mobilizer Fowler had announced that the three major producers accepted changes in the terms of government contracts under which the producers had agreed to expand their facilities to meet national defense requirements.

Williams, Harvey & Co., British tin smelter, closed a deal for what amounts to Patino's "nationalized" production of tin concentrates in Bolivia. The contract extends to the end of 1955. The settling basis will be the London market. Shortly before this deal was announced, the RFC purchased 5,000 tons (tin content) from nationalized mines on the basis of $1.17½ a pound, f.o.b. South American ports.

Copper Duty Suspension

Legislation has been introduced in Congress to suspend the import duty on copper until June 30, 1954. The measure has been approved by the House. A hearing before the Senate Finance Committee has been called for Feb. 3. Extension of the period of suspension is expected before the expiration date of present legislation on Feb. 15. Heavy imports of copper will be needed to satisfy this year's demands of both industry and the stockpile.

Rumors to the effect that Chile intends to raise its price of copper, possibly to 38½¢, were not taken seriously here. The foreign market, outside of Chile, has not been in a particularly strong position in recent months.

Producer deliveries of refined copper to fabricators, and shipments of copper products (copper content) by fabricators to their customers, during 1952, by months, in tons, were as follows:

	Deliveries to Fab.	Fabricators Shipments
January	130,430	131,988
February	104,795	115,150
March	112,625	116,887
April	107,355	106,109
May	105,362	110,388
June	98,416	107,709
July	115,384	82,624
August	127,910	120,084
September	135,486	123,740
October	138,759	127,120
November	125,338	130,031
December	143,088	117,303
Totals	1,445,764	1,389,451

Stocks of refined copper in the hands of fabricators at the end of 1952 totaled 333,455 tons, which compares with 315,608 tons a month previous and 280,402 tons at the beginning of last year.

Unfilled orders on the books of fabricators totaled 275,312 tons as 1952 ended, against 303,050 tons at the beginning of last year.

Sales of lead were in good volume most of the month. Except for the threat of larger imports, growing out of renewed weakness abroad the outlook here was considered to be favorable. The decline abroad forced down the price level here to 14¢, N.Y., a net loss for the month of three-quarters of a cent a pound.

The strike at the Port Pirie refinery in Australia was settled late in January, but not until a full month's production was lost, estimated at slightly more than 15,000 tons of lead.

Production in the U.S. is expected to decline as a result of the lower prices being realized on the metal. St. Joseph Lead has shut down one of its two furnaces at Herculaneum.

January lead settled on the London Metal Exchange on Jan. 29 at £96½ asked, equivalent to a shade above 12¢ a pound.

Zinc dropped to 12¢ on the common grade, f.o.b. East St. Louis. Production is expected to fall, possibly by as much as 25%, in the event that a recovery fails to materialize shortly. A

Average Prices for January (E&MJ Quotations)

Copper:

Electrolytic, domestic, refinery 24.200
Electrolytic, export, refinery .. 34.780

Lead:

Common, New York, ... 14.192
Common, St. Louis 13.992

Silver and Sterling Exchange:

Silver, New York, per oz. 84.500
Silver, London, pence per oz. .. 73.518
Sterling Exchange, "Checks" 281.289

Zinc:

Prime Western East St. Louis 12.588

Tin:

New York Straits 121.500
New York, 99% min. ....(e) 120.500

Gold, per oz. U.S. price $35.000
Quicksilver, per flask 212.962
Antimony (E&MJ) (d) 37.970
Antimony, bulk, Laredo 34.500
Antimony, in cases, Laredo . 35.000
Platinum, refined, per oz. .. 90.000
Cadmium (a) 193.269
Cadmium (b) 204.135
Cadmium (c) 215.000
Aluminum, 99% plus, ingot . 20.173
Magnesium, ingot 24.500
Nickel (f) 58.654

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange checks, in cents. Quicksilver, per flask of 76 lbs.
(a) Cadmium average based on the producers' quotations.
(b) Cadmium average based on the average of the producers' and platers' quotation.
(c) Cadmium average based on platers' quotation.
(d) Domestic, 5 tons or more but less than carload lot, packed in cases, f.o.b. New York.
(e) Tin content.
(f) F.o.b. Port Colborne, U.S. duty included.

Markets Continued on Page 138

reduced rate of output is necessary to stabilize the world market. Mexican zinc was available at around 10¼¢, f.a.s. Gulf ports, as the month ended.

Quicksilver was under pressure of freer offerings of Indian surplus metal and larger supplies from Mexico. The scarcity ended when imports of unsold metal increased early in January.

Cadmium moved back $2, eliminating the spread in prices that has prevailed on commercial shapes for well over a month.

"Free" Gold Market

Activity in the market for free gold centered in the Far East. Manila and Bombay scored gains of about 4% during January. The buying movement, taking the market as a whole, moderated, totaling $90-million, which compares with $100-million in December.

	COINS		BARS (12.5 kg.)	
	Dec. 31	Jan. 31	Dec. 31	Jan. 31
NEW YORK, transit	....	....	$37.60	$37.85
MANILA	$45.50	$47.50	37.80	41.10
HONG KONG	46.00	47.00	40.50	40.90
BOMBAY	46.00	50.00	43.00	47.35
TANGIER	47.00	46.80	37.50	37.80
BEYROUTH	46.50	47.25	37.55	37.90
PARIS	51.00	50.60	39.30	38.95
BUENOS AIRES	48.50	47.00	39.75	40.50

Major Metals

U. S. DAILY AND AVERAGE PRICES

Jan. 1953	Electrolytic Copper (a) Domestic	(b) Export	Straits Tin New York	Lead New York	Lead St. Louis	Zinc East St. Louis
	Holiday	Holiday	Holiday	Holiday	Holiday	Holiday
2	24.200	34.650	121.500	14.750	14.550	12.800
3	No Market	34.425	121.500	14.750	14.550	13.000
5	24.200	34.550	121.500	14.750	14.550	13.000
6	24.200	34.800	121.500	14.750	14.550	13.000
7	24.200	34.875	121.500	14.500	14.300	13.000
8	24.200	34.525	121.500	14.500	14.300	13.000
9	24.200	35.000	121.500	14.500	14.300	13.000
10	No Market	34.475	121.500	14.500	14.300	13.000
12	24.200	34.675	121.500	14.000	13.800	13.000
13	24.200	35.050	121.500	14.000	13.800	13.000
14	24.200	34.875	121.500	14.000	13.800	12.500
15	24.200	34.425	121.500	14.000	13.800	12.500
16	24.200	35.250	121.500	14.000	13.800	12.500
17	No Market	34.325	121.500	14.000	13.800	12.500
19	24.200	35.150	121.500	14.000	13.800	12.500
20	24.200	35.075	121.500	14.000	13.800	12.500
21	24.200	34.950	121.500	14.000	13.800	12.500
22	24.200	34.900	121.500	14.000	13.800	12.500
23	24.200	34.650	121.500	14.000	13.800	12.500
24	No Market	34.475	121.500	14.000	13.800	12.500
26	24.200	35.125	121.500	14.000	13.800	12.500
27	24.200	34.925	121.500	14.000	13.800	12.000
28	24.200	34.925	121.500	14.000	13.800	12.000
29	24.200	34.700	121.500	14.000	13.800	12.000
30	24.200	34.900	121.500	14.000	13.800	12.000
31	No Market	34.600	121.500	14.000	13.800	12.000
AVERAGES FOR MONTH						
Jan. 1953	24.200	34.780	121.500	14.192	13.992	12.588
AVERAGES FOR WEEK						
Jan. 7	24.200	34.660	121.500	14.700	14.500	12.960
14	24.200	34.767	121.500	14.250	14.050	12.917
21	24.200	34.863	121.500	14.000	13.800	12.700
28	24.200	34.833	121.500	14.000	13.800	12.333
CALENDAR WEEK AVERAGES						
Jan. 3	24.200	34.695	121.500	14.700	14.500	12.660
10	24.200	34.704	121.500	14.583	14.383	13.000
17	24.200	34.767	121.500	14.000	13.800	12.667
24	24.200	34.867	121.500	14.000	13.800	12.500
31	24.200	34.863	121.500	14.000	13.800	12.083

Silver, Gold and Sterling

DAILY AND AVERAGE PRICES

Jan. 1953	Sterling Exchange "Checks"	Silver (c) New York	Silver London	Gold (d) London	Gold (d) United States
	Holiday	Holiday	Holiday	Holiday	Holiday
2	280.8750	Not quoted	72 8/16d.	248s.	$35.00
3	(e)	(e)	(e)	(e)	35.00
5	281.0000	83.250	73.000d.	248s.	35.00
6	280.9375	83.250	73.000d.	248s.	35.00
7	281.0000	83.250	73.000d.	248s.	35.00
8	280.7500	83.250	73.000d.	248s.	35.00
9	280.8125	83.250	73.000d.	248s.	35.00
10	(e)	(e)	(e)	(e)	35.00
12	281.1250	83.250	73.000d.	248s.	35.00
13	281.1250	83.750	73.000d.	248s.	35.00
14	281.1250	84.250	73.000d.	248s.	35.00
15	281.2500	84.750	73.500d.	248s.	35.00
16	281.4375	85.250	73.500d.	248s.	35.00
17	(e)	(e)	(e)	(e)	35.00
19	281.4375	85.250	74.000d.	248s.	35.00
20	281.4375	85.250	74.000d.	248s.	35.00
21	281.3750	85.250	74.000d.	248s.	35.00
22	281.4375	85.250	74.000d.	248s.	35.00
23	281.5000	85.250	74.000d.	248s.	35.00
24	(e)	(e)	(e)	(e)	35.00
26	281.6250	85.250	74.000d.	248s.	35.00
27	281.6250	85.250	74.000d.	248s.	35.00
28	281.6875	85.250	74.000d.	248s.	35.00
29	281.7500	85.250	74.000d.	248s.	35.00
30	281.7500	85.250	74.000d.	248s.	35.00
31	(e)	(e)	(e)	(e)	35.00
AVERAGES FOR MONTH					
Jan. 1953	281.289	84.500	73.518	—	35.00
AVERAGES FOR WEEK					
Jan. 7	280.953	83.250	—	—	
14	280.988	83.550	—	—	
21	281.388	85.150	—	—	
28	281.575	85.250	—	—	

Calendar Week Averages, New York Silver: Jan. 3rd, 83.250; 10th, 83.250; 17th, 84.250; 24th, 85.250, 31st, 85.250.

(e) No Market (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.300c. per pound, the average differential for delivery charges.

(b) Our export quotation for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c. for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingotbars; cathodes are sold at a discount of 0.125c. to 0.15c. per pound. Quotations for zinc are based on Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered, in the East, Middle West, and West, effective Jan. 1, 1951, commanded a premium of 1.35c. per pound over the current market for Prime Western; Special High Grade 1.50c.

Quotations for lead are based on domestic common lead. Corroding lead commands a premium of 10 points.

(c) The daily New York silver quotation reported by Handy & Harman is for silver contained in ores and other unrefined silver-bearing materials, in cents and fractions of a cent per troy ounce. It is determined by Handy & Harman on the basis of actual sales of bar silver .999 fine in amounts of 50,000 ounces or more for nearby delivery at New York, as reported daily by regular suppliers, and is usually one-quarter cent below the price paid for such bar silver, this deduction being the allowance to such suppliers for carrying, delivering and marketing. In addition to foreign silver, the quotations also apply to domestic silver if such silver enters into the New York market.

The Treasury's purchase price of newly mined domestic silver is 90.5c. per troy ounce 1000 fine, effective July 1, 1946. London silver in pence per troy ounce, basis .999 fine.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold is at .99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

Behind the By-Lines . . .

G. P. Lutjen

This Annual Review number got completely out of hand this year. It went storming through January like a driverless stagecoach in a Class D Western film, with the managing editor leading a posse of haggard editors in hot pursuit. In addition to the usual number of unusually fine reviews of both commodities and technology, a passel of added attractions swarmed in that clearly demanded prompt publication. We crammed in as many as we could. The net result is a bonus issue for the reader.

For instance, there's the story of the Humboldt Iron project on p. 128. It gives you all the dope on the first commercial flotation of iron ore, the first attempt to treat the Jaspers of northern Michigan. Then there's the 12-page review of the most popular new equipment items of 1952, on page 156. And don't overlook the "Gismo" story on page 148. This one-man-band-type machine has performed a minor miracle with productivity at the Grandview mine.

With 83 "Annual Survey and Outlook Numbers" tucked away, this review business begins to take on all the aspects of a habit. And with this "84th Annual Etc.," we prove ourselves beyond the cure. Having run out of customary grist for the review mill, we decided to survey *E&MJ* itself for 1952. While this may seem like Dr. Kinsey describing his first date in the Kinsey Report, we feel that after looking into everyone else's business the only decent thing to do is to throw open *E&MJ's* files for '52 with a Quixotic disregard for the consequences —a decision, we might add, we reached immediately after looking at the record.

As 1952 drew to a close, there were 16,840 of you readers compared with 16,200 twelve months earlier. What is important about this, to us anyway, is that *the* vital segment of the mining industry wants *E&MJ*. The evidence is the business world's most reliable kind; the readers pay for *E&MJ*. Further, even applicants who want to pay for subscriptions are screened to keep our readership a mining readership, from up and coming shifters to company presidents. We feel that with a paid circulation of this high caliber we can do a better job of serving both reader and advertiser.

Keeping *E&MJ* worthy of your evident esteem and confidence kept eight editors busy full time in 1952. Five of these editors, all engineers, traveled about 50,000 miles to bring you articles and information first hand. In addition, not a single edition went to press without contributions from top notch mine, mill or smelter men.

Besides working to keep you abreast of key developments in a rapidly expanding industry, the editors mindful of your limited time and crowded schedules, put in a lot of effort to make technical articles more readable, less time-consuming, and to keep key informative points from being buried in an avalanche of uninformative details.

We'd like to think we were helpful elsewhere besides the pages of *E&MJ*. For instance 5,050 (at last count) of you sent in requests for more information on new products via the customary postage card. The 24,264 inquiries broke an annual record and strained our relations with the lady who takes charge of inquiries.

Numerous requests for other types of information came in by mail, telephone, and carrier pigeon. Most of these were inquiries about the metal markets. How Hans Wanders, market editor, manages to answer all of them (we once counted 21 phone calls he received in one day) and still get out the weekly market paper, *E&MJ Metal and Mineral Markets*, remains a source of constant amazement for us more readily distracted neophytes.

Other inquiries range from the routine to the utterly confounding, like the fellow who wanted us simply to tell him all about gold for his 10-cents' worth of telephone conversation. He hung up when his dime ran out on the third syllable of "cyanidation" and just as we were really warming to our subject.

As a concluding note to this harangue, there are a number of rash promises we might make about future operations, but we haven't got the nerve. Let's just say we'll keep plugging to give you your dollar's worth in *E&MJ* and to serve you individually, and the industry collectively, in any way we can.

We're convinced that people are getting as hysterical about dead fish as they are about chlorophyll. Last month we noted that the Department of Interior was busy studying the dead fish situation. And only this morning we were stopped cold by a headline in the morning paper, "Scientist Racing by Plane to Save a Dead Fish."

Sure enough a fast perusal reveals that a South African Air Force plane is rushing one J. L. B. Smith, ichthyologist, toward an Indian Ocean island to try to help preserve a dead fish. The reason this carcass is so important is that the specimen belongs to the first family of bony fish, once believed extinct for at least 50-million years—a mere week-end as geologists reckon time. Before this fish had cartilage instead of bones. Study of this particular fish may reveal why our finny ancestors finally decided to forsake the sea for the land.

For months the following clipping from the *New York Times* has been wallowing prominently in the litter on our desk. More to get rid of it than anything else, here it is.

"LONDON, Nov. 24 (Reuters)—Special beers, twice as strong as those now being sold, are being prepared for the coronation period next year, it was announced at a brewers' exhibition today. The special coronation beer bottles will have a special label bearing a crown."

Wistfully typewritten across the top was the poetic wish, "O to be in England when the froth is on the stein." We subscribe to this sentiment, but we'll probably spend the better part of our odd moments in the next few months wondering just why they are doubling the potency of the local brew for the coronation.

ENGINEERING AND MINING JOURNAL

FEBRUARY, 1953

A Time of Crisis

NEVER IN THE 84 YEARS that the successive editorial staffs of *E&MJ* have produced an Annual Review and Outlook Issue has the review covered such extraordinary developments and the outlook been so critical.

We are not referring, of course, to technological developments. In this respect, the industry last year progressed about as usual. Nothing occurred, however, that could compare in import with economic and political events:

In 1952, the vast majority of companies in the mining industry accepted, and some actively sought, government aid in one form or another, usually as a loan, as a fixed-price purchase contract, or in the tax benefit of fast amortization.

In 1952, as a result, there was about completed a roll of expansion projects that totals an eventual investment in the U. S. alone of over $2-billion in the metal and nonmetallic mining industry. This is undoubtedly expansion on the grandest scale in the industry's history.

In 1952, the U. S. Government forced U. S. consumers to pay 36½¢ per lb. for imported copper no better in quality than domestic copper for which they paid U. S. producers 24½¢ per lb.

In 1952, the Bolivian Government was overthrown, and the revolutionists expropriated Bolivia's privately-owned tin mines. We now find the U. S. Government buying tin from the expropriators.

In 1952, it became fashionable to worry about metal and mineral supplies, so much so that a considerable body of opinion has grown up favoring one or all of the following: "conserving" U. S. minerals in the ground and buying supplies abroad; wiping out tariffs on imported metals and minerals; establishing government-controlled international buffer stocks of metals to stabilize world metal prices and thus remove one of the investment risks in mining.

In 1952, the U. S. Government expanded the stockpile idea to include purchase of nearly 30,000 tons of lead with the sole purpose of supporting the lead market.

This list could be expanded, but perhaps this is enough to make the point that nothing the mining industry did last year of its own free will had nearly the effect, nor the far-reaching implications, of what the government did for it, or to it.

The outlook, one is forced to conclude, is for more of the same. The only difference is that the top jobs in government for at least the next four years will be in the hands of men who understand the problems of free enterprise capitalism as it exists today.

These men are already finding that the problems of government look quite different when they sit behind desks in Washington instead of in front of them. Naturally, the troubles of the mineral industries make up only one spine of the huge and thorny problem they face. No sweeping change in handling mining's problems is likely to be brought about unless the treatment of the whole problem of government-industry-world relationships is drastically changed.

In the mining field, our government faces a world in which the scope of free enterprise operation is declining. The freedom of private companies outside the U.S. to locate and work mineral deposits, and to sell the products where and how they wish, is ever more circumscribed.

Mining must also, of course, consider its own problems in the light of the overriding world problem of the warming-up "cold war" against Communism. Much that has been done, and much that will be done, will be excused, rightly or wrongly, on the basis of relationship to this struggle.

All in all, it seems to us that from here on, the mining industry will be living in a changing world in which the concepts we grew up with will have different meanings, if they survive at all. This industry, and all industry, faces a crisis sometime in these next four years through which it cannot go unchanged. The efforts of all of us are needed to limit and to direct that change, if we really believe in the economic system we live by.

Your understanding of today's problems, not just your own and your company's problems, but your country's and the world's, must come first. That takes study, thought, listening, argument, and more thought.

Then must come your active help, not only for your company, but for your industry's societies, for their forward-looking spokesmen, and for the job to be done in Washington, if that is asked of you. Your work in the days ahead may help turn the scale. Give it cheerfully and give it to the fullest.

Gold

World's output rises once more; official monetary gold holdings increase. Inflationary pressure slackens, cutting down private hoarding.

DR. M. A. KRIZ
New York, N. Y.

THE YEAR 1952 was characterized by three major gold developments. In the first place, world gold output (excluding the USSR) increased from 24.0-million fine ounces in 1951 to an estimated 24.4-million in 1952, or by almost 2%. Last year's output therefore was only slightly below the postwar peak of 24.5-million in 1950.

Secondly, a distinctly smaller portion of the world gold output than in 1951 went into industrial uses or private hoards, or was otherwise unaccounted for. The slowing down in gold disappearance seems to have reflected principally a decline in demand attributable to an abatement of inflationary pressure in large areas of the world. Free-market gold prices moved generally downward.

Thirdly, complementing the slowing-down in gold disappearance, official monetary reserves of central banks, governments and international institutions increased during the first nine months by an amount equal to some two-fifths of the current gold output. In 1951 only one-seventh of all newly mined gold had found its way into official reserves, the lowest increment for any postwar year. Another feature that marked last year's changes in official monetary gold reserves was the subsidence of the large net purchases of gold by the United States that had marked July, 1951, through March, 1952. This reflected principally the gradual improvement in the payments positions of many foreign countries, especially the sterling area, an improvement secured to a considerable extent only by discriminatory cuts in imports.

The author is on the staff of the Federal Reserve Bank of New York. The views he expresses are his own and are not meant to reflect those of the Bank.

Rise in World Output

World production of gold rose last year by some 400,000 oz. to a total of 24.4-million,[1] on the basis of preliminary or incomplete data (Table I). The estimate for 1952 is more than 3-million oz. above the 1945 postwar low and some 12-million oz. below the 1940 all-time record. However, current gold output is well above the 1920-30 average, as will be seen from the accompanying chart; and although it declined in 1951 for the first time since the war, it appears in 1952 to have resumed a steady rise of about 2% annually.

Last year's increase in world gold production seems attributable almost entirely to the expansion in South African output by some 300,000 oz., or 2.5%, to an estimated total of 11.8-million, the first increase for South Africa since 1949.

On the whole, it is now clear that the world's 1949 currency readjustments, which had the incidental result of raising the gold price in terms of the devalued currencies, failed to stimulate gold production. Although 1952 was the third full year after the 1949 sterling devaluation and the accompanying 44% increase in the sterling gold price, output in the sterling area probably was no higher in 1952 than in 1949. In 1951 it had actually been smaller.

Gold producers of course took

1. All data used herein exclude the U.S.S.R.

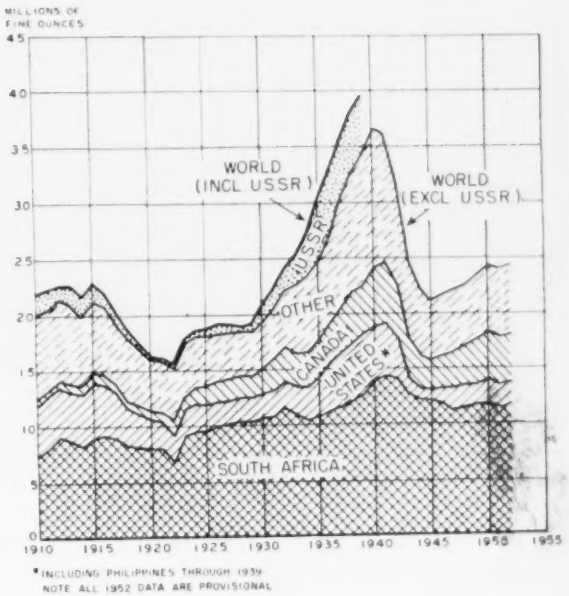
Table I.—World Gold Production

(IN MILLIONS OF FINE OUNCES)

	1940	1949	1950	1951	1952[a]
North America:					
Canada	5.3	4.1	4.4	4.4	4.4
United States	4.9	1.9	2.3	1.9	1.9
Latin America:					
Mexico	0.9	0.4	0.4	0.4	0.5
Colombia	0.6	0.4	0.4	0.4	0.4
Chile	0.3	0.2	0.2	0.2	0.2
Nicaragua	0.2	0.2	0.2	0.3	0.2
Africa:					
Union of S. Africa	14.0	11.7	11.7	11.5	11.8
Gold Coast	0.9	0.7	0.7	0.7	0.7
Southern Rhodesia	0.8	0.5	0.5	0.5	0.5
Belgian Congo	0.6	0.4	0.3	0.4	0.4
Asia:					
India	0.3	0.2	0.2	0.2	0.2
Philippines	1.1	0.3	0.3	0.4	0.4
Australia	1.6	0.9	0.9	0.9	0.8
Total	31.6	21.8	22.5	22.1	22.5
Other countries, excluding USSR	5.1	2.0	2.0	1.9	1.9
World, excluding USSR	36.7	23.8	24.5	24.0	24.4

[a] Tentative figures based on preliminary or incomplete data.

Note: Figures may not add up to totals because of rounding.



advantage of the higher sterling gold price to work lower grades of ore and thus prolong the life of their mines. Operating costs, however, increased considerably. In South Africa costs had risen by about one-third from Sept., 1949, to Dec., 1951, but the upward pressure was apparently eased in 1952. Notwithstanding the rise in costs, working profits of the Rand mines last year were still 68% above the predevaluation level.

Apart from the 1949 devaluations and the rise in operating costs, the profitability of gold mining was affected last year by several other developments. The tax rates applicable to gold mining in South Africa remained unchanged, even though those for other industries were increased. Furthermore, sales of newly mined gold in the free markets at premium prices brought additional revenue to the gold mines in a number of countries, although such revenue was much smaller than in 1951. The additional revenue of South African gold mines which in 1951 was $1.70 per oz. produced (or about 5% above the official price of $35) does not seem to have exceeded $1.25 last year.

In the latter part of 1951, Canada, Southern Rhodesia, Australia, and various other producing countries likewise allowed gold mines, on certain conditions, to sell part of their current output for nonmonetary uses at premium prices. With the so-called free gold price (the limited significance of which will be noted later) apparently only slightly above $37 per oz., the margin of profit offered by the premium market was quite narrow.

In Canada, the differential subsidies granted under the Emergency Gold Mining Act of 1948 were continued during 1952 for gold producers channeling their entire output into the official reserves (those who sold in premium markets had to forego the subsidy). It was announced in November that, beginning with January 1953, such payment would be increased to avert mine shutdowns due to rising production costs and lowered returns. The latter reflected partly the fall to less than Can. $34 of the price paid by the Royal Mint for Canadian gold production, a decline caused by the rise in the Canadian dollar to a premium over the United States dollar. In 1952 the subsidy averaged about Can. $2.80 per fine ounce produced. In 1953 it is reported to amount to Can. $3.80. In Southern Rhodesia plans for subsidizing gold were officially announced for the country's mines.

From such information as is available, it appears that South Africa sold last year about two-fifths of its gold output, or some $150-million on the free market at premium prices. In Canada perhaps no more than a dozen out of a total of some 60 mining companies were selling gold in the free market. However, these presumably included many large lower-cost firms, and a considerable portion of the current Canadian output went into free markets last year.

Reduced Gold Disappearance

A comparison between the volume of gold output of countries outside the USSR and the increase in the total official gold reserves of these countries and of international institutions indicates that some $365-million in gold went into industrial uses or private hoards or was otherwise unaccounted for during the first nine months of 1952, as against $470-million during the nine-month period from April through December, 1951, and $560-million during the preceding months (July, 1950-March, 1951) immediately following the outbreak of hostilities in Korea. In contrast, such gold disap-

Table II.—Reported Free-Market Gold Prices

	Hong Kong HK$ per tael	Hong Kong US$ per fine oz.[1]	Bombay Rupees per tola	Bombay US$ per fine oz[2]	Alexandria E£ per dirhem	Alexandria US$ per fine oz.[2]	Paris Francs per gram	Paris US$ per fine oz.[3]
1949—Mid-September[4]	330	47	114	92	154	64	629	52
1950—Mid-June[5]	262	38	113	63	151	42	440	39
1951—September[6]	341	43	110	62	162	45	573	44
December	320	42	107	60	163	45	572	42
1952—June	300	41	90	51	167	47	489	39
September	291	40	89	50	175	50	499	39
December—middle	280	40	79	44	172	48	504	38
December—end	282	41	84	47	n.a.	n.a.	516	39

[1] Converted at the free-market exchange rate.
[2] Converted at the official exchange rate.
[3] Converted at the "parallel" market rate.
[4] Prior to the currency devaluations on Sept. 18.
[5] Prior to the outbreak of Korean hostilities on June 25.
[6] Prior to the International Monetary Fund's gold policy statement of September 28, after which several countries permitted their gold producers to engage in premium gold transactions under certain conditions.
n.a. Not available.

Table III.—United States Net Gold Purchases From Other Countries

(In millions of dollars; negative figures indicate net sales by the United States)

	Total	United Kingdom and overseas sterling area	Continental Europe[1]	Latin America	Asia and Oceania	All other countries[2]
1949—year	193	642	—250	—148	—52	2
1950—year	—1,725	—1,007	—364	—172	—35	—147
1951—year	75	522	—177	—126	—50	— 94
1951—first quarter	— 876	— 400	—193	—237	—19	— 28
second quarter	— 56	— 67	— 24	73	— 2	— 35
third quarter	291	340	— 26	12	— 4	— 31
fourth quarter	716	649	66	26	—25	—
1952—first quarter	557	524	33	4	3	—
second quarter	106	7	—	94	— 2	7
third quarter	— 1	—	—	— 2	a	a

[1] Almost entirely Western European countries.
[2] Including Canada.
[3] Less than $500,000.
Note: Totals do not necessarily add up because of rounding.
For data for individual countries, see the *Federal Reserve Bulletin*.

pearance amounted to only $180-million during the preceding nine months (Oct., 1949-June, 1950) immediately after the world-wide currency devaluations.

The slowing down in gold disappearance last year seems to have reflected a decline in demand in Western Europe, especially France, as well as in the Middle and Far East. This decline appears attributable principally to the abatement of inflationary pressure and to the reversal in expectations of currency devaluation in some European countries. The reduced demand, along with the pressure of increased supplies already noted, tended to depress free-market gold prices.

The price at which gold was traded directly for United States dollars in various markets outside the United States reportedly fell from about $39 per fine ounce in Jan., 1952 (in Jan., 1951, it had stood at $44) to about $37 in April. From May through November it apparently fluctuated between $37 and $37.50, but at the end of November it reportedly fell below $37, the lowest quotation since the Korean outbreak in June, 1950. It reportedly stood at about $37.50 at the year-end.

Not too much should be read into these prices since, as is well known, there is no free market for gold coins or bars in the United States, and the so-called dollar price actually reflects transactions by traders abroad in gold that either is located outside the United States or is merely shipped into this country for refining and re-export.

Prices in Hong Kong, Bombay, Alexandria, and Paris, as reported in the press, are given in Table II, along with their United States dollar equivalents computed by converting the local-currency price into dollars at such rates of exchange as are available.

Even though the present free gold prices are much closer to the official gold price than at any time since the Korean outbreak, the gold disappearance still seems to have been unduly large last year. This was the outcome in part of international political uncertainties, of the lack of genuine currency stabilization in much of the Western World despite last year's abatement of inflationary pressure, and of the strong hoarding tradition in the East.

If more newly mined gold than last year is to flow into the monetary reserves of central banks and governments, such currency stability as has thus far been achieved in the West must be consolidated along lines that will create economic conditions such as will make demand for hoarding negligible.

Foreign Monetary Reserves

The third salient gold development last year was the improvement in the monetary reserve positions of foreign countries. This improvement was brought about in two ways. First, as already noted, a larger portion of the newly mined gold than in 1951 found its way into the monetary gold reserves of central banks and governments and international institutions. Secondly, the large net purchases of gold by the United States that marked international gold movements from July, 1951, through March, 1952, subsided by mid-1952. The United States actually sold some gold by the year-end.

Some $260-million in gold (about 40% of the current gold output) was added to official monetary gold reserves during the first nine months of 1952, as against $150-million (about 25%) during the nine-month period from April through Dec., 1951, and only $70-million (slightly over 10%) during the preceding nine-month period from July, 1950, to March, 1951. The post-Korea fall in the annual accretions to monetary gold reserves reflected,

of course, the upsurge in gold disappearance already noted. This was in sharp contrast with the pre-Korea situation, when during the nine months from Oct., 1949 through June, 1950 some $450 million (70% of the current gold output) had appeared in world monetary gold reserves. In the latter part of 1952, newly mined gold was flowing in increasing amounts into monetary gold reserves, but a great gap still remained.

The second feature of last year's changes in official gold reserves was, as already noted, the reversal in United States gold movements. From July, 1951 through March, 1952, the United States had purchased $1,564 million in gold from foreign central banks and governments, mostly as a result of a sharp deterioration in the payments position of the sterling area. From April, 1952 through Sept., 1952, only $104-million was thus purchased (Table III). While the bulk of United States purchases during July, 1951-March, 1952 came from the United Kingdom, as banker of the sterling area, those effected during April-September, 1952 originated mostly in Latin America. During the last quarter of 1952, for which complete data of United States gold purchases and sales are not yet available, United States gold stocks declined by $274 million.

Largely as a result of these net purchases of foreign gold, the monetary stock of the United States increased from $21.9-billion in June, 1951 to $23.5-billion in Sept., 1952 (Table IV). In Dec., 1952 it stood at $23.3-billion. The rest of the world (excluding the U.S.S.R.) experienced an aggregate decline in its monetary gold stocks from $12.4 billion in June, 1951 to $10.7 billion in June, 1952. They stood at $10.6 billion in Sept., 1952, after various transfers totaling almost $200-million, to the international institutions.

Including the gold stocks of the International Monetary Fund, the Bank for International Settlements, and the European Payments Union, the world's monetary gold reserves (excluding the U.S.S.R.) amounted in Sept., 1952 to $36.2-billion, as against $36.0-billion a year previous. Of this total the United States held 65%, as against 62% in Sept., 1951.

As is apparent from Table IV, the monetary gold reserves of countries other than the United States (and the U.S.S.R.) last September were about $0.8-billion higher than in June, 1950, and about $1.6-billion higher than in September 1949. They were still some $3.0-billion lower than at the end of 1945, before the start of the serious depletion of the early postwar years.

Table IV.—World Monetary Gold Reserves

(In billions of dollars)

	Dec. 1945	Sept. 1949	June 1950	June 1951	March 1952	Sept. 1952[p]
United States	20.1	24.7	24.3	21.9	23.4	23.5
All other countries[1]	13.7	9.0	9.8	12.4	10.9	10.6
International institutions[2]	—	1.5	1.6	1.7	1.8	2.1
World[1]	33.8	35.3	35.7	35.9	36.0	36.2

[p] Preliminary.
[1] Excluding USSR; partly estimated.
[2] International Monetary Fund, Bank for International Settlements, and beginning with March, 1952, the European Payments Union.

Note: Totals do not necessarily add up because of rounding.
For data for individual countries, see the *Federal Reserve Bulletin*.

In addition to these monetary gold reserves, foreign countries also held dollar balances and certain other dollar assets in the United States on both official and private account. Taking foreign gold reserves and dollar holdings together, the total declined by $1.3 billion from July, 1951 through March, 1952, but then increased by $1.0-billion from April through Sept., 1952, standing in the latter month at $19.6 billion, $4.9 billion higher than in Sept., 1949 but still $1.1 billion less than in 1945.

The general improvement in the reserve positions of foreign countries in 1952 was unevenly distributed geographically. However, a distinctive feature was the large number of countries that gained gold and dollar assets, although some of the gains were relatively moderate. In the latter part of the year, the United Kingdom made the largest individual gains.

Outlook Improves

At the year-end, unimpeded multilateral trading and general currency convertibility appeared to be still remote, although 1952, the first year after the five-year "transition period" around which the entire edifice of the International Monetary Fund had been built, was supposed to have marked the achievement of these objectives. Nevertheless, many countries seemed last year to be making greater strides toward stabilizing their economies, domestically and externally, than at any time since the war. More particularly, the sterling area, which accounts for more than one-fourth of total world trade, appeared at the year-turn to be on its way to a better balance in international accounts.

As for 1953, one thing is certain, namely, that the gradual attainment of a self-supporting external position by foreign countries and areas requires a foundation of sustained growth in production and productivity in flexible and adaptable economies. This in turn hinges largely on a consolidation of such monetary balance as was attained last year in the principal countries, and on a determined effort to build new economic relationships within the Atlantic Community, and between the Atlantic Community and the rest of the Free World, that are self-sustaining.

It must be realized, however, that increasing the United States gold price would accomplish little in this direction. Apart from its effect on gold mining itself, a higher dollar gold price is not an effective way of dealing with the structural problems of the world economy. The potential gains for international liquidity and for the foreign exchange reserves of other countries that might accrue would be comparatively small. Finally, the geographical distribution of such increments would be uneven and wholly random. The addition to international liquidity as the result of a higher dollar gold price would therefore not be significant enough to bring lasting relief from the prevailing international payments difficulties.[2]

[2] For a comprehensive discussion of this question see the author's "The Price of Gold," *Essays in International Finance*, No. 15 (International Finance Section, Princeton University, July, 1952).

Silver

Domestic demand for silver coins may be hard to satisfy. Output about unchanged. Strong consumer influence seen in new Administration.

HERBERT M. BRATTER
Washington, D. C.

FOR SILVER, 1952 was a rather uneventful year, from both economic and political standpoints. The American silver statutes remained unchanged and unattacked. Internationally the metal's political status was equally still. At the annual meeting of the International Monetary Fund in Mexico City in September, not even Mexico, the world's largest silver producer and once claimant for world action, had a word to say on the subject.

Both political platforms, and both presidential candidates, maintained a silver silence. One scans the pages of the Congressional Record in vain for an echo of former silver debates.

The November election turnover, of course, served as a reminder that all the silver-supporting laws on the books came into being under Democratic administrations. The Republican platform asks for sound money. It's worth noting that the silver users, who in the past have complained about the silver laws, now have at least two of their number close to the President: Secretary of Commerce Sinclair Weeks, of Reed and Barton; and Undersecretary of the Treasury Marion B. Folsom of the Eastman Kodak Co. The latter is located in New York, home state of the chairman of the powerful Ways and Means Committee, Daniel A. Reed, at times past an advocate of silver repeal.

Imports of silver ore and base bullion declined about 33% from 1951, totaling about 75.5 million oz., whereas only 2 million oz. of refined bullion was exported. With all newly mined silver moving to the mints to get the statutory 90½¢ an ounce enacted in 1946, the industrial demand for the metal had to be met by foreign silver.

U. S. and foreign silver coins were both imported and exported in 1952, notably in the trade with Cuba. It will be recalled that in 1951 some 37 million oz. of foreign silver coin entered the U. S. A. and that some 21,600,000 of this was Cuban. In 1952 only 200,000 oz. of such silver entered the U. S. A., while exports totaled 4.1 million oz., the greatest part going to Cuba. In 1952 (through November), the U. S. mints struck Cuban coins to a total of 2,163,000 oz. and used an additional 181,000 oz. to mint coins for Honduras.

Production Steady

U. S. mine output of silver in 1952 totaled 40.5-million oz., about the same as the 1951 figure of 40.0-million oz. Nearly all of this is considered to be by-product silver.

With few exceptions, silver production has pursued a downward trend in recent years, a phenomenon which evoked comment by the International Monetary Fund in September. The exceptions are Canada, Bolivia, and the Belgian Congo, where mine output of silver stands at approximately prewar levels. In Canada's case this reflects a marked recovery from the 1940-1947 decline. Canada's 1952 production rate was (through September) rather better than in 1951. Mexico's monthly production reports are sometimes erratic, perhaps reflecting deliveries rather than actual mining; but on the whole appear to have gained slightly in 1952. For the world as a whole, silver production has been about 40% smaller than prewar.

The price of silver has risen for both American domestic mines and foreign, as compared with prewar. Both industrial consumption and coinage have increased. U. S. official buying for stock under the Silver Purchase Act, of course, is the biggest missing factor today. The IMF has tabulated the various changes.

During 1952, with the U. S. making a market for its own mine production at 90½¢ an ounce, Mexico continued to dominate the market for other silver, stabilizing it by acting as both seller and buyer as occasion demanded. The Bank of Mexico buys the entire domestic production and at times buys abroad. Some of the metal it coins for internal circulation.

Mexico also coins silver for other governments. In June, for example, the press reported that Mexico had contracted to mint another $6.5-million worth of rials for Saudi Arabia, bringing to $40-million the total minted for that country. The silver 5-peso coins issued for internal circulation in 1952 had a lower silver content than those of 1947 and 1948, which with the decline in the Mexican exchange rate disappeared from circulation.

In New York Handy and Harman's "official price" of foreign silver remained at 88¢ an ounce from the beginning of 1952 until May 5, when an expected increase in demand from silverware manufacturers failed to develop, the price was lowered gradually until it reached 82¾¢ on May 28. On July 24 it was adjusted to 83¼¢, where it remained the rest of the year. The Treasury's buying price for newly mined domestic silver was 90½¢ throughout 1952, this being the statutory price.

England's Plans

Although the United Kingdom has been demonetizing silver coins since World War II, the purpose seems not to be the accumulation of metal for liquidation of the lend-lease obligation. It is largely from the demonetized stock that the Bank of England has been supplying silver for the internal industrial and export trade. The demonetization process has been slowed up by the relative scarcity of substitute metals suitable for coinage. Sales of demonetized silver in Britain during 1952 were probably less than the 1951 sales of some 16 million oz.

Reports during the year that exporting silver from Britain has involved loss of hard currency earnings, met with denials in New York. If London silver is acquired by outsiders with cheap sterling, the sterling price paid for the silver is sufficiently higher than the New York price to make a "racket" impossible, traders stated. However, the British still report that the Continent buys more silver in London than is needed and re-exports the surplus to hard-currency countries. This routine the British call "shunting." The British licensing authorities try to make sure that exported

silver is not shunted by the Continental buyer, but not with complete success.

Late in the year London reported a narrowing of the discount on transferrable sterling, with an attendant decline in the premium on exportable silver.

Dilemma For U.S.

Strong demands in the U. S. for subsidiary silver coins in 1952 forced the Mints Bureau to dip heavily into the government's stock of uncommitted silver. Continuance of this trend promises sooner or later to require a decision: 1, to go into the market and buy foreign silver for U. S. coins; or 2, to find a way to use some of the vast hoard kept at West Point and elsewhere as currency backing. This is an interesting question, well worth a brief discussion.

Free silver (that which is not held as security for silver certificates) in the Treasury's hands on Dec. 10, 1952, totaled 84-million oz. Consumption of free silver for coinage in 1952 was about 56-million oz., but in 1953 and 1954 rate of consumption is expected to exceed 61-million oz. annually. Thus present stocks would be exhausted sometime in 1954, although they would be augmented by seignorage on domestic newly mined silver coming to the mints. That seignorage amounts to 30% of the domestic mine output, assuming it all ends up in the Treasury rather than the open market. Therefore, for each 40-million oz. mined in the U. S., 12-million is added to the free silver account. Through Nov., 1952, the mints had received 37,250,000 oz. of domestic newly mined silver.

But even if the free silver supply were exhausted, a review of the statutes suggests that the government need not turn to the open market for more. While the Treasury has issued no ruling on the matter, a careful review of related legislation makes it seem clear to me that ample power exists to call in silver certificates and release silver to be used in coining subsidiary silver coins for issuance to the public. At least nothing in the purchase acts of 1934 or 1946 prohibits it, nor does any other law that I have heard of.

Would Lend-Lease Help?

Certainly return of all the silver lend-leased by the U.S. during the war would alleviate the situation greatly, but neither the return of this silver nor its disposition afterward is clear-cut. The amount of silver lead-leased to other governments is as follows:

Government	Millions of oz.
India	226.0
United Kingdom	88.3
Netherlands	56.7
Saudi Arabia	22.3
Australia	11.8
Ethiopia	5.4
Belgium	0.3
Fiji Islands	0.2
Total	411.0

All this was to be repaid within five years after the end of the war, which means by April 28, 1957. The period may be extended another two years for Ethiopia, Saudi Arabia, and for 100-million oz. of India's obligation by mutual agreement. No one expects to see much of this lend-leased silver come back before the due date.

Belgium, however, has returned 261,333-1/3 oz. of its lend-leased silver, and the disposition of it may give a clue to the future. This silver went to Belgium originally from the Treasury's free silver account. It had cost about 46¢ per oz., but because of an intervening price rise, the Treasury charged Lend-Lease 71¢ for the silver and put the profit into its "Miscellaneous Receipts."

Instead of reversing this process when Belgium's silver came back, the Treasury, on Sept. 19, 1947, authorized the Mint Bureau to buy at 71¢ the returned Belgium silver from the Lend-Lease Administration. The Treasury issued enough silver certificates to finance the purchase, under the powers of the Act of 1934, and the silver to back these new certificates was put into the "Silver" fund. This account appears in the Treasury's Daily Statement showing the amount held as security for silver certificates. Only that part of the Belgium silver representing the seignorage found its way back to the free silver account.

When and if the more than 410-million oz. of lend-lease silver comes back to the U.S., and if the Treasury handles it as it did the Belgium

(Continued on page 238)

Copper

U. S. main support of world market in 1952. Dual pricing system retards return to normal operating conditions. Fabricators obtained more copper than in any year since 1945. Imports increase.

H. H. WANDERS
Market Editor

Statistics in Brief	(a) 1952
U. S. Production (mine)	928,000
U. S. Production (smelter)	1,010,000
U. S. Imports (ore and metal)	598,000
U. S. Exports (refined)	178,000
Consumption (deliveries)	1,445,764

* Preliminary figures (tons).

DESPITE NUMEROUS OBSTACLES that stood in the way of establishing a free market for copper, consumers in this country managed to obtain more metal during 1952 than in any year since 1945. Fabricating plants obtained 1,445,764 tons, or about one-half of the Free World's available supply. Demands again were abnormally high because of the defense program, record activity in general construction and manufacturing, and steady expansion in production and use of electrical energy.

Contrary to expectations, production of copper at the mines increased only slightly. Strikes, along with labor, transportation and power shortages, combined to check an anticipated expansion in domestic output. Intervention by government agencies in the involved business of producing and marketing copper and copper products also took its toll by discouraging extra effort toward maximum production.

Copper Statistics—1947 to 1952

The following summary of copper statistics, reported by members of Copper Institute, accounts for most of the world's production. It excludes the U.S.S.R. and countries behind the Iron Curtain, as well as a few countries of minor importance. The figures are in short tons.

	Crude Production		Refined	Deliveries to	Stocks Refined
	Primary	Secondary	Production	Fabricators	End of Period
United States					
1947	871,391	105,307	1,196,393	1,383,666	76,035
1948	850,088	130,410	1,233,697	1,344,445	96,080
1949	772,986	135,052	1,056,463	1,031,595	116,027
1950	940,249	117,439	1,270,768	1,371,464	49,040
1951	964,589	56,910	1,199,784	(a) 1,367,787	(b) 71,528
1952	962,512	45,975	1,189,112	(a) 1,445,764	(b) 58,858
Outside United States					
1947	1,229,825	8,995	1,016,856	921,851	143,979
1948	1,271,884	8,526	1,072,229	901,073	175,669
1949	1,270,529	10,241	1,076,114	933,641	147,972
1950	1,347,356	11,387	1,127,329	898,601	139,919
1951	1,378,833	5,360	1,225,018	1,013,450	152,203
1952	1,400,394	9,607	1,196,426	1,005,329	130,103
Combined Totals—U. S. and Outside U. S.					
1947	2,101,216	114,302	2,213,249	2,305,517	220,014
1948	2,121,972	138,936	2,305,926	2,345,518	271,749
1949	2,043,515	145,293	2,132,577	1,965,236	263,999
1950	2,287,605	128,826	2,398,097	2,270,065	188,959
1951	2,343,422	62,270	2,424,802	2,381,237	223,731
1952	2,362,906	55,582	2,385,538	2,451,093	188,961

(a) Includes tonnages delivered from government stocks.
(b) Includes tonnages delivered to U.S. consumers at foreign ports.

A pricing policy in this country that seemed to satisfy no one except the professional politician undoubtedly kept needed primary metal and scrap off the market.

Scare buying virtually disappeared abroad and fancy premiums began to soften early in the year, pointing to a gradual return to a more rational pricing arrangement. However, those who were optimistic on this score were doomed to disappointment. Inability of Chile to market its 20% take out of its home production at $1,200 per metric ton brought fresh complications into the picture.

Domestic Ceiling Holds

Repeated suggestions by members of the copper industry's advisory committee to the effect that the pricing regulations in the domestic market were unrealistic went unheeded. Another wave of wage hikes was allowed by those charged with stabilizing the economy. The cost of producing copper continued to rise. Yet the Office of Price Stabilization held on sternly to its 24½¢ ceiling on domestic copper as if the metal were a special case operating apart from the country's highly inflated business structure.

Though sales abroad at fancy premium prices dried up, major producers operating outside of the United States were able to get more for their copper. After Chile obtained a higher price on sales to the United States, other foreign producers also raised their prices, though not to the same extent as the Chileans.

The monthly averages of *E & MJ* for domestic and foreign copper, f.o.b. N.Y. refinery equivalent, in cents a pound, follow:

	1952	
	Domestic	Foreign
January	24.200	27.425
February	24.200	27.425
March	24.200	27.425
April	24.200	27.425
May	24.200	27.908
June	24.200	34.586
July	24.200	34.815
August	24.200	34.904
September	24.200	34.824
October	24.200	34.751
November	24.200	34.681
December	24.200	34.780
Averages	24.200	31.746

Prices realized on foreign copper beginning with June varied between 33½¢ on sales abroad converted to the New York f.a.s. equivalent, to 36½¢ delivered Connecticut Valley on Chilean metal.

The low ceiling on domestic copper certainly diverted copper-bearing material in the form of scrap to other than normal channels. In 1949, for instance, custom smelters recovered 135,052 tons of refined copper from secondary sources. During 1952, their share of metal produced from scrap dropped to 45,975 tons.

Chile Upsets Market

By the middle of February it became evident that Chile could not dispose of its set-aside out of home production at prices substantially higher than those obtaining in the open market. This meant that revenue from its all-important copper industry was falling. Rumors, apparently well-founded, mentioned various proposals for correcting a bad situation that threatened to further unbalance the country's economy. Toward the end of February, Chile's Foreign Minister confirmed that his government has been negotiating for a new agreement.

On May 2, 1952, Chile renounced its agreement with the United States. This accord provided for the delivery of 80% of Chile's production of copper to the United States on the basis of 27½¢ a lb. All shipments to this country were stopped, effective with May. Preceding this move, a strike was called at Anaconda's Chilean properties. The Central Bank of Chile announced that it would take over control of all sales. It fixed the price at 35½¢ f.o.b. Chilean ports.

Dr. John R. Steelman, then acting director of the Office of Defense Mobilization, announced on May 21 that a new agreement affecting copper imports from Chile at a higher price than 27½¢ had been reached at the government level after weeks of almost continuous negotiation. As if to soften the blow, he added that price relief would be granted to brass and wire mills up to 80% of the added cost of foreign copper.

Releases Stockpile Copper

With the movement of Chilean copper to this country sharply curtailed because of the strike and inability to ship pending developments in connection with the new agreement, agitation for the release of stockpile metal to consumers in this country increased. President Truman authorized that 22,000 tons be released from the strategic reserve to offset the temporary shrinkage in imports. So far as

could be ascertained, not all of this tonnage was allocated to industry. Additions to the government's stockpile during 1952 were light, probably totaling less than 10,000 tons.

The Controlled Materials Plan, placed into operation in the preceding year to regulate distribution of the three key commodities—steel, copper and aluminum—remained in force throughout the year, but the trend was toward gradual easing of its limitations, particularly in the production of consumer goods. As tension eased the practicability of the plan was questioned in many quarters. The machinery for operating such a scheme effectively presented an almost impossible task. The plan was costly to all concerned.

Distribution of copper to domestic consumers was vastly complicated under the dual pricing system. The National Production Authority, in allocating copper under the wide spread in prices, ordered fabricators in this country to absorb 60% of their requirements out of "cheap" 24½¢ domestic metal and 40% from the available supply of higher priced foreign metal.

This meant that all fabricators were obliged, under the regulations, to purchase both domestic and foreign copper, even if a domestic mining company had previously been in a position to take care of all its subsidiary's needs. The action was privately denounced as confiscatory, but under the circumstances no attempt was made to challenge the order.

IMC Takes a Hand

The International Materials Conference tried to do a job in establishing an orderly market for copper by assuring smaller nations that they would obtain metal for home consumption without disrupting the market.

During 1952, the IMC issued "entitlements" for a total of 2,958,945 metric tons of copper. Of this total the United States was allotted 1,451,700 tons. All told, some 40 countries participated in the plan. As the year ended the program appeared to be in a bad way because of complaints from "dissatisfied customers," and most observers felt that it would fall apart before the end of the first quarter of 1953. The supply situation outside of the United States had eased and the mad rush for copper by foreign buyers ended. In announcing its findings for the first quarter of 1953, the Copper-Zinc-Lead Committee of IMC declared that it intends to review the supply-demand situation in copper in January to ascertain whether allocations be continued for all of 1953.

Whether the IMC actually kept copper and copper products from moving behind the Iron Curtain, as originally planned, was a moot question on which opinion differed sharply in copper circles.

Inventories Rise

Government officials maintained stoutly that the supply situation in copper in this country will remain tight until 1955. In backing the further suspension of the 2¢ import tax on copper, up for extension before Feb. 15, 1953, Secretary of Commerce Charles Sawyer said the essential program for which copper has been allocated could never have been met in 1952 without huge quantities of foreign metal.

However, the 1,445,764 tons of copper that were delivered to fabricators (wire and brass mills) during 1952 undoubtedly eased the supply situation in a number of end products that do not show up in any of the published statistics compiled for the industry. Few consumers, as the year ended, experienced difficulty in obtaining copper products.

The December statistics of Copper Institute disclosed that fabricators obtained 143,088 tons in that month alone, a record not equalled since Jan., 1947. Copper authorities thought the heavy deliveries resulted from some anticipatory shipments of January metal, along with larger imports from sources other than Chile.

All available evidence points toward a more comfortable supply situation, notwithstanding the continuing heavy demand for copper from fabricators in this country. The fact that buyers here could obtain their total requirements at a lower price than the world price may have been a factor in stimulating the demand. If a buyer had limited his purchases to the 60-40 basis, his cost would have averaged 29.3¢ a lb., taking the two extremes of 24½¢ for domestic metal and 36½¢ for foreign. European buyers on the other hand were paying 34¼¢ and upward.

After the storm occasioned by the Chilean deal subsided, Empire producers supplied the British with copper at the equivalent of 33½¢, f.a.s. N.Y. Katanga, operating chiefly in the European market, also held to this basis on regular sales to its customers.

Outlook Still Confused

Producers here feel certain that the pricing problem in copper in this country will be simplified during 1953. There is a good chance that price controls will be removed completely and only limited standby regulations on use remain in force. A free market in copper should result in a higher price on the domestic product and a lower selling basis on foreign metal. In short, being a world commodity, copper would naturally return to a single pricing standard if left to its own devices.

However, governments have taken an active part in managing the affairs of the copper industry because of the vital part the metal plays in defense. In the case of a country like Chile, copper production enters into the nation's strained fiscal program as one of its chief sources of revenue.

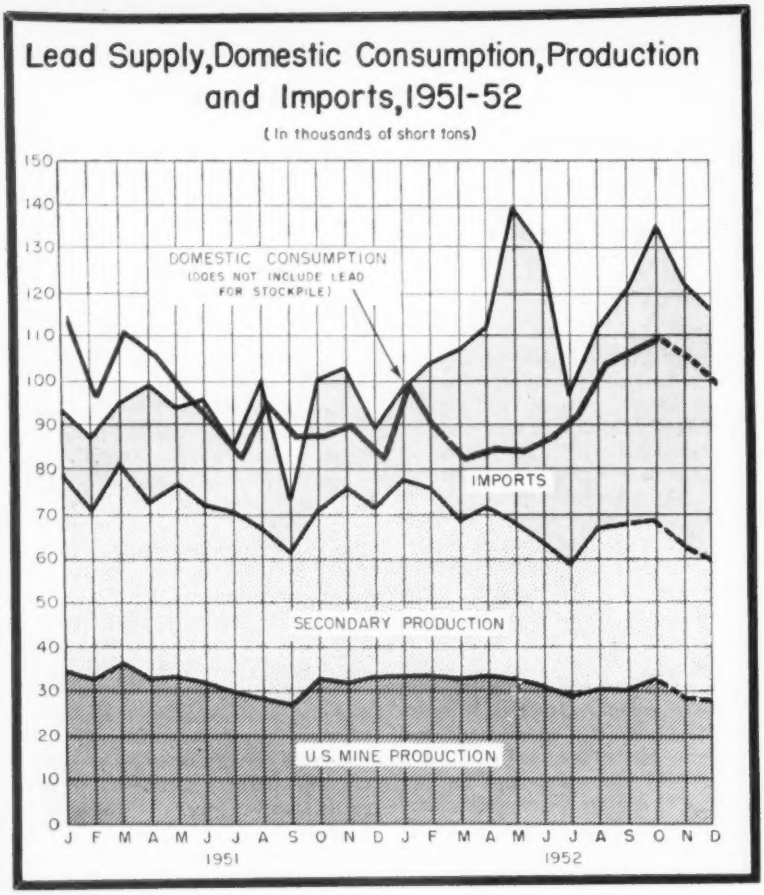
Political conditions and tensions will have an important bearing on the extent to which governments will permit copper to return to its rightful place as a free commodity. With a new administration in power in Washington, more businesslike methods can be expected in so delicate an operation as pricing copper under more competitive conditions that loom for 1953. Stockpiling policy will be reviewed and possibly altered to fit into any situation that may arise. The stockpile in copper has a long way to go.

But buyers everywhere have sobered up considerably after two years of hectic activity, and they now believe that the copper supply in 1953 will be ample, even though volume of business remains high.

Production of copper at the mines, here and abroad, is scheduled to increase during 1953, possibly by as much as 10%. Once holders of scrap are convinced that the boom in copper is nearing an end, this material will begin to move in greater volume and add to the supply of refined metal.

Competition with aluminum is bound to increase, particularly if the price of copper remains too high, or consumers worry excessively over obtaining an adequate supply when they want it.

The continued high rate of industrial activity, coupled with defense spending, supported the world market for copper throughout 1952. A moderate recession here, without a return to heavy stockpile purchases or another "off the market" deal with Chile, could result in a healthier pricing situation in copper during 1953.



Lead

Doubled imports, easier demand, high domestic output depress U. S. market in 1952, but stockpiling, revived consumption brighten outlook.

ROBERT L. ZIEGFELD
Secretary
Lead Industries Association
New York, N. Y.

THE FEATURE of the lead market in 1952 was its sudden about-face, going from a position of apparent extreme scarcity to one of plenty in a matter of weeks. Actually the factors that brought about this change and the simultaneous collapse in price had been at play for a longer period but were hampered by artificial controls. Also, the apparent "extreme scarcity" never existed to the extent that most people believed, the trouble being largely one of maldistribution and scare-buying rather than actual lack of metal.

Here is what happened in brief. Lead entered 1952 with the ceiling on both domestic and foreign lead at 19¢ per lb., to which it had been raised from 17¢ on Oct. 2, 1951. This was still several cents below the world market.

However, since American buyers were unable to attract foreign lead at this ceiling and were therefore badly in need of metal, the government decided to make available to American consumers 30,000 tons of lead from its permanent stockpile to tide them over. Of this amount 10,000 tons was allocated to industry in Dec., 1951, and another 7,000 tons in Jan., 1952. This helped to ease the pressure of domestic buyers.

At the same time foreign buyers began to realize that they were overstocked with lead as a result of their heavy buying in 1951, and they also experienced monetary difficulties. Therefore, foreign demand eased, the world price came down to meet the domestic price, and American buyers were able to enter the world market to help satisfy their demands.

Simultaneously, a bill introduced in Congress in 1951 to suspend the duty on lead until March, 1953, or until the price fell below 18¢ per lb. for a calendar month, was passed and became effective Feb. 12.

Shortage Ends

All these things combined to ease the supply-demand picture so that the 13,000 tons remaining out of the 30,000 tons of stockpile lead that had been authorized for allocation to consumers never was allocated. In fact, by April heavy purchases abroad resulted in an oversupply which broke the price 1¢ on April 29, another cent on May 2, and 2¢ more on May 12, or a 4¢ per lb. reduction in two weeks.

All this was happening at a time when demand for lead products, particularly storage batteries, fell below expectations. Thus the price remained below 18¢ during May and caused the automatic restoration on June 28 of the import duty of ¾¢ per lb. on lead in ore and 1 1/16¢ per lb. on pig lead.

In June consumers came back into the market heavily, feeling that their inventories needed replenishing, that business was improving, and that the price had gone low enough. Sales in that month were a near record and resulted in a price advance of 1¢ per lb. late in the month.

About this time the Defense Materials Procurement Agency announced its intention of acquiring 30,000 tons of lead for a civilian stockpile, to be released to consumers if a shortage again developed, or to be transferred to the permanent stockpile at the year-end if not needed by the civilian economy. Although this

Table 1—U. S. Lead Supply and Demand

(In Short Tons)

SUPPLIES	1951[1]	Estimated 1952
From:		
Domestic ores	388,200	385,000
Foreign ores & base bullion	70,000	100,000
Secondary[2]	482,500	440,000
Imports of metal	178,900	475,000
Delivered from stockpile	10,000	7,000
Total	1,129,600	1,407,000
Changes in stocks at primary smelters and refineries	13,600 (Decr.)	25,000 (Incr.)
Total	1,143,200	1,382,000
DEMAND		
Industrial consumption[2]	1,151,000	1,150,000
Change in consumers' stocks	27,700 (Decr.)	25,000 (Incr.)
Total	1,123,300	1,175,000
Apparent excess of supply over demand[3]	19,900	207,000

1 American Bureau of Metal Statistics, U. S. Bureau of Mines, Lead Industries Association
2 Does not include secondary lead in brass or bronze
3 Includes lead delivered to government stockpile and some foreign lead delivered to American sellers and not yet resold.

Table 2—Use of Lead in The United States[a]

(In Short Tons)

	1951	Estimated 1952
White Lead	25,700	21,000
Red Lead & Litharge[b]	78,700	54,000
Storage Batteries	353,800	380,000
Cable Covering	136,900	138,000
Building[c]	60,700	60,000
Tetraethyl	127,500	155,000
Ammunition	31,100	26,000
Foil	2,800	3,000
Bearing Metal	33,700	32,000
Solder	65,400	70,000
Typemetal	23,700	23,000
Calking	43,800	46,000
Other Uses	167,200	142,000
TOTAL	1,151,000	1,150,000

[a] American Bureau of Metal Statistics
[b] Exclusive of oxides for storage batteries
[c] Chiefly pipe, sheet and extrusions. Includes lead used in chemical construction.

plan met with considerable opposition in some quarters, it was carried out and most of the 30,000 tons was purchased in July and August.

About this same time Congress excluded lead scrap from the bill which extended the suspension of the import duties on nonferrous scrap to June 30, 1953.

Consumption of lead, and particularly the storage battery business, was good during the late summer months so the market held reasonably firm until October, despite some unsettlement imparted to it by weakness in zinc. However, the British Government announced that free trading in lead would be resumed on the London Metal Exchange on Oct. 1 for the first time in 13 years. Although the British Government had disposed of nearly 60,000 tons of lead to the permanent U.S. Government stockpile early in the year, by the time of the opening of the Exchange to lead trading, Britain still held well over 100,000 tons.

There was, of course, considerable concern as to what would happen to the price of lead when Exchange trading started, since the British Government announced that it would dispose of its stocks to consumers at the closing price on the Exchange each day.

It did not take long to find out what would happen. The official British price to consumers just before trading started was £131 per long ton. On the Exchange the price opened at £111 and by Oct. 22 had plummeted to £80, equivalent to about 10¢ London or 12¢ per lb. duty paid, delivered New York.

The London Exchange price ultimately regained much of its losses so that at the year-end it was in the neighborhood of £104 per long ton.

The improvement in London was the result of several factors. Some of the excessive government stocks had been liquidated. The government also arranged to resell part of its stocks to producers to be disposed of in an orderly manner as the market could absorb it. In addition, the government decided to hold fairly sizable stocks as an emergency stockpile. Meanwhile consuming business abroad showed improvement.

The New York price followed the London fluctuations fairly closely. Starting with Oct. 7, it dropped 2½¢ per lb. in two weeks to 13½¢ on Oct. 22, then recovered to a high of 14½¢ on Nov. 10, fell again to 14¢ on Nov. 24, and again rose ¼¢ on Dec. 22, another ¼¢ on Dec. 29, and still another ¼¢ on Dec. 30, closing the year at 14¾¢ per lb. This still was about ¼¢ below London parity.

While it may seem like the tail wagging the dog to have the London price so influence the domestic price when the statistical picture in the United States is good, nevertheless the threat of heavy imports when London declined below the New York equivalent was enough. In fact, heavy purchases were doubtless made by American buyers on the London Exchange when the London price was well below the New York price in the early weeks of trading on the Exchange. These purchases will swell imports in subsequent months beyond all normal proportions. However, that seems to have been an extraordinary situation that is now a thing of the past.

What in general was the statistical picture that led to the year's actions in the lead market? Domestic mine production in 1952 was only slightly less than in 1951 although towards the year-end several properties, including the Silver King in Utah and several in the Southwest, shut down.

Secondary production in the United States showed a drop of about 10%. The big difference came in imports which rebounded to above the record 1950 level. In fact they were more than double 1951 imports and herein lies the big difference in American supplies between 1951 and 1952. The total supply in 1952 was about 275,000 tons greater than in 1951 at 1,400,000 tons. Industrial consumption in the two years was al-

most identical. The increased supplies thus went partly into refiners and consumers stocks and partly into government stockpile, for which heavy purchases were made, and accounted for the weaker market in 1952 as compared with 1951.

It is interesting to note here that as early as April, 1952, the Lead Industries Association, representing both producers and consumers, by resolution adopted at its annual meeting, appealed to both NPA and OPS to remove controls as no longer necessary. While NPA was quite prompt in relaxing, and then removing controls, OPS has still refused to remove its controls over lead even though the situation is such that the current price is 5¢ per lb. below the ceiling, which is still 19¢ per lb.

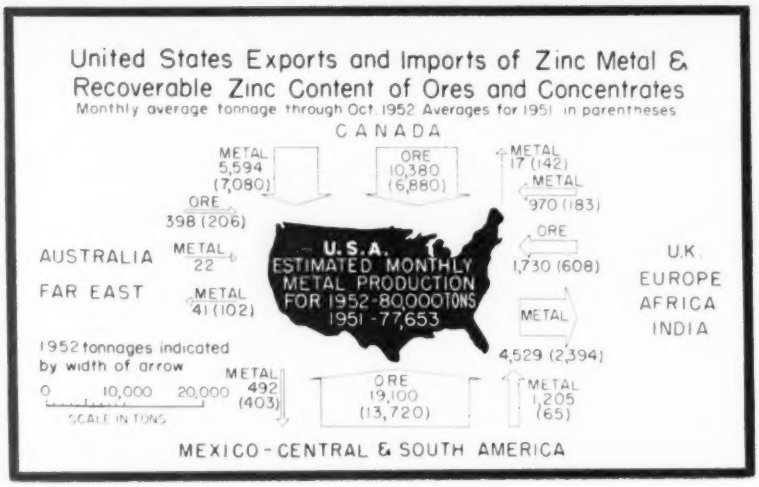
It is quite obvious from the history of lead in the years since the last war that, given adequate price incentive, the industry is capable of producing at a rate in excess of industrial requirements. Thus hundreds of thousands of tons have gone into stockpile without embarrassing industry except for limited periods of time. Even that embarrassment could probably have been avoided, if the industry had been hampered less by unwise controls and injudicious decisions on the part of governments.

While consumption in 1953 should be at a good rate, as it has been for the last three years, it is not quite clear what the miner has in store. He has been beset by rising costs, but is faced with possible shutdowns due to lower prices for his product. In recent months a sliding scale equalization tax and other plans to aid the American miner without direct subsidies have been advanced. They have gained important support in many quarters.

Supply Will Be Adequate

The one thing that seems reasonably certain is an adequate supply of lead for all legitimate industrial needs at a price that will bring it out.

The miner may derive some optimism from the fact that conditions which upset the market in recent months have largely disappeared. Unwieldly stocks abroad have been reduced and the foreign supply is no longer able to flood the American market as it has done recently so long as consuming business remains good here.



Zinc

Surplus, not deficit, marks 1952 supply, as buying fever ends. Good demand, perhaps record consumption, in prospect for 1953.

CHARLES R. INCE
Vice President
St. Joseph Lead Co.
New York, N. Y.

THE DEFICIT IN SUPPLIES of zinc predicted for 1952 by various government agencies did not materialize. Through most of the year, consumers had the rare opportunity of buying and using zinc without government restrictions. The transition from government controls to a relatively free market was not an easy one for either producers or consumers, as the surpluses which had developed rather than the expected deficits, resulted in a drastic drop in the price from 19.5¢ per lb. at the beginning of the year to a low of 12.5¢, which prevailed at the year's end.

Domestic smelter production of slab zinc totaled around 950,000 tons, slightly exceeding the 932,000 tons produced the previous year. This was the greatest quantity produced in the peacetime history of the United States, an output exceeded only by the World War II years of 1942 and 1943.

Table I.—Summary U.S. Slab Zinc Supply and Consumption for 1952

Supply		Tons*
1. U. S. primary and secondary production		950,000
2. Imports		100,000
		1,050,000
3. Less exports		60,000
		990,000
4. Stockpile shipments	40,000	
less diversion to industry	20,000	20,000
5. Available for consumption		970,000
Consumption		
6. Galvanizing	380,000	
7. Zinc-base alloys	240,000	
8. Brass	150,000	
9. Rolled zinc	50,000	
10. Oxide plants and other	30,000	850,000

* Based on latest figures available.

Smelters could have produced over 1-million tons if demand had warranted it, as concentrates were in ample supply due to availability from abroad as well as to a high rate of domestic mine production in the early part of the year.

Mine production has been estimated at 660,000 tons of recoverable zinc, practically the same as the previous year. Concentrate imports ran substantially higher at close to 440,000 tons compared to 1951's 303,000 tons of recoverable zinc.

Slab zinc consumption in 1952 was off slightly from the previous year due chiefly to the steel strike. While industrial activity (with which metal consumption usually varies directly) was around 217 according to the Federal Reserve Board's Index, compared to 200 the year before, zinc consumption declined 9% to 850,000 tons against 933,000 tons in 1951. The steel strike affected zinc to a greater extent than most nonferrous metals, in that the two major uses, galvanizing and die casting, are very closely allied with the availability of steel. The use of zinc in galvanizing, for example, dropped from 400,000 tons in 1951 to 380,000 tons in 1952 rather than increasing as might have been expected with expanded steel capacity.

Zinc-base alloy usage declined to a greater extent, a drop of 20% to 240,000 tons from 296,000 tons in the previous year. While shortage of steel was one of the causes of the lower use for die castings, in that it affected the production of vehicles and electrical appliances which account for nearly 70% of die casting applications, two other factors also contributed to the drop.

One was the unfavorable price relationship which existed at the end of 1951 and early 1952 between zinc and aluminum, major competitors in the die casting industry. With aluminum die cast alloy selling at 20.5¢ and zinc at 19.5¢, the zinc price was 95% of the aluminum price; whereas, experience has indicated that a ratio of not more than 75% is safer if zinc is to retain its competitive position.

The other factor was the government restriction on the use of nickel in plating which practically prohibited the neck "coat" so necessary to the proper chrome finishing of zinc-base die castings. The substitute coatings which were developed were so unsatisfactory that many potential users were discouraged. Fortunately, this situation was partially rectified about midyear by relaxation of the nickel order permitting a nickel "flash" of .00005 in. With these two deterring factors out of the way, we may expect a continuance of the expansion in the use of zinc in die casting that has marked the phenomenal growth of this industry in the last 25 years.

The other three major uses of zinc in order of importance are brass, rolled zinc, and zinc oxide, with brass accounting for by far the largest tonnage. The brass industry used 150,000 tons in 1952, slightly higher than the previous year's 143,000 tons, which was accounted for by an increased use of virgin metals in place of normal scrap, the return of which was im-

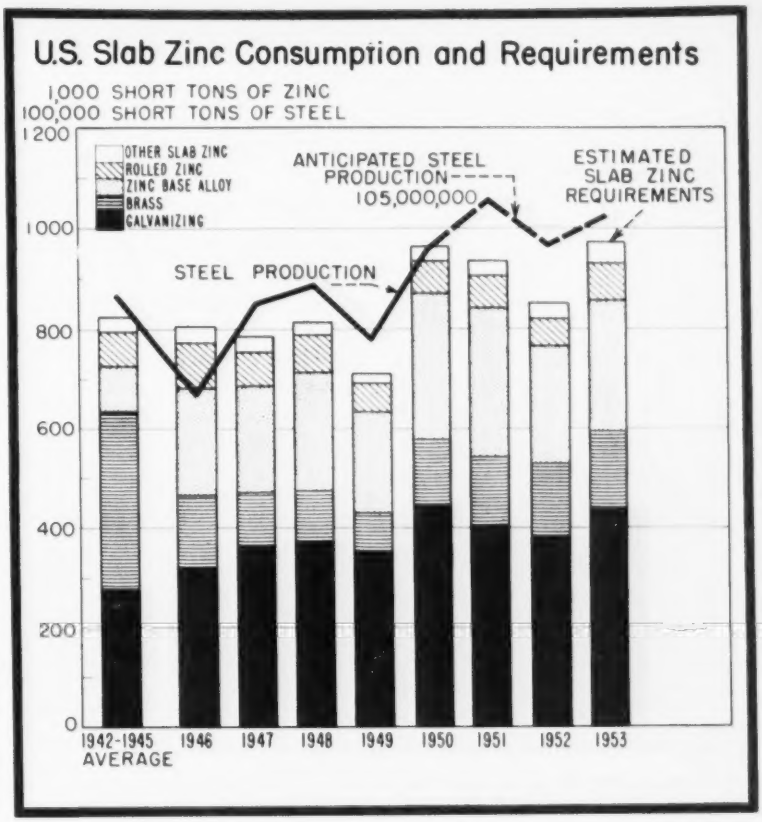


Table II.—Total Slab Zinc Smelter Output (All Grades) 1949-1952, Short Tons

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
			SHIPMENTS						
	Stock Beginning	Production	Domestic	Export & Drawback	Gov't Acct.	Total	Stock at End	Unfilled Orders at End	Daily Avg. Prod.
1949	20,848	870,113	648,285	56,929	91,526	796,740	94,221	42,625	2,384
1950	94,221	910,354	849,246	18,189	128,256	995,691	8,884	74,795	2,494
1951	8,884	931,833	836,800	42,067	39,949	918,816	21,901	50,509	2,553
1952									
Jan.	21,901	83,205	75,039	1,782	1,582	78,403	26,703	55,760	2,684
Feb.	26,703	77,296	70,928	4,882	1,638	77,448	26,551	70,442	2,665
Mar.	26,551	85,028	79,897	5,275	403	85,575	26,004	66,820	2,743
April	26,004	83,011	72,716	9,123	3,753	85,592	23,423	56,838	2,767
May	23,423	83,797	63,701	5,425	4,950	74,076	33,144	41,494	2,703
June	33,144	77,463	35,769	7,757	3,739	47,265	63,342	39,428	2,582
July	63,342	78,930	38,714	3,146	1,493	43,353	96,919	46,547	2,482
Aug.	96,919	78,167	72,963	4,091	1,381	78,435	96,651	44,522	2,521
Sept.	96,651	76,019	69,343	3,654	5,132	78,129	94,541	42,791	2,534
Oct.	94,541	80,588	71,659	3,827	4,301	79,787	95,342	37,533	2,600
Nov.	95,342	78,563	81,439	4,625	4,692	90,756	83,149	32,295	2,619
Dec.	83,149	81,133	71,068	2,665	3,562	77,295	86,987	45,264	2,617
		961,200	803,238	56,252	36,626	896,114			
Monthly Average		80,100	66,936	4,688	3,052	74,676	Daily Average		2,626

peded by the imposition of unrealistic price ceilings.

Rolled zinc consumption dropped 20% to 50,000 tons from 1951's 64,000, probably due to the decline in dry cell battery manufacture with the completion of military contracts, and also to changes in packaging requirements which have partially eliminated use of zinc jar caps.

French Process zinc oxide used around 20,000 tons, the same as the previous year, while miscellaneous applications such as wet batteries, lead de-silverizing, light metal alloys and chemical products, accounted for the usual 10,000 tons for the year.

A summary of slab zinc supply and requirements for 1952 appears in Table I.

The apparent surplus in 1952 is accounted for by increases in consumers' and smelters' stocks which by Oct. 1 had risen by nearly 100,000 tons. The chart shows graphically the variation in slab zinc consumption over the last decade and includes a projection of slab zinc requirements for 1953, based on National Production Authority estimates.

The domestic picture was not too bad from the point of consumption, in view of the steel strike, and could have sustained a price considerably better than the 12.5¢ at which the year ended if it had not been for the foreign situation. Over-buying abroad during 1951, particularly in the United Kingdom, had built up stocks of zinc and concentrates to unnecessary levels. This, coupled with high production under the incentive of the fantastic prices which prevailed in world markets that year, provided considerably more metal than could be consumed on the Continent and in England in 1952.

Prices broke rapidly from the 30¢-40¢ range which had prevailed in 1951 to between 10¢ and 10.5¢ by early fall of 1952. As the world price fell below the U. S. level and surplus supplies were diverted to this country, the domestic price was forced down to the world parity, which at the year's end was 12.5¢ St. Louis versus a 10.5¢ Continent price.

There was some concern at the end of the year that with resumption of zinc trading on the London Metal Exchange on Jan. 2, there might be a repetition of what happened in lead when trading was resumed in October, and the market would weaken. However, the British

(*Continued on page 204*)

Tin

For the fifth consecutive year, tin output exceeds world's consumption, U. S. stockpile taking the excess. Bolivian unrest is biggest headache.

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C. Tennant Sons & Co.
New York, N. Y.

1952 WAS THE FIFTH consecutive year in which world mine production of new tin exceeded the world's industrial use of new tin. The excess of production in 1952 is estimated at 50,400 long tons, and the excess of production over use during the past five years has reached the imposing total of about 167,000 long tons. This is just about equivalent to one full year's output by all the tin mines of the world at the current rate of production. Thus far most of this surplus has been siphoned off into the U. S. Government stockpile.

Table I.—World Mine Production of Tin

(Recoverable tin in concentrates)
(Thousands of Long Tons)

	Av. 1936-39	1951	1952 12 Mos. Ended Aug. 31
Far East			
Malaya	60.9	57.2	57.1
Indonesia	31.9	31.0	34.9
Thailand	14.9	9.5	9 2
China	10.8	3.6	3.6
Australia	3.3	1.6	1.6
Other Far East	9.0	1.5	1.5
Total Far East	129.9	104.4	107.9
The Americas			
Bolivia	25.4	33.1	33.2
Other Americas	2.1	1.1	1.1
Total Americas	27.5	34.2	34.3
Africa			
Belgian Congo	8.3	13.7	13.5
Nigeria	9.6	8.5	8.4
Other Africa	1.9	1.2	1.3
Total Africa	19.8	23.4	23.2
Europe			
Portugal-Spain	1.2	2.2	2.6
United Kingdom	2.0	1.0	.9
Other Europe	.5	.1	.2
Total Europe	3.7	3.3	3.7
World Total*	180.9	165.3	167.7 (Sept.)

* Not including U.S.S.R. Production began in Russia in 1934, but no reliable data have been made available.

It will be recalled that, following the sharp rise in the world price of tin in the latter part of 1950 and early 1951, the weight of the U. S. Government was brought into play in no uncertain manner. Industrial use of tin in the U. S. after Jan. 1, 1951, was restricted to 80% of the average monthly use in the first half of 1950, and at the same time restrictions were placed on the amount of tin that might be carried in inventories.

Private importation of tin was forbidden as of March 12, 1951, and the Reconstruction Finance Corp. became the sole importer. The GSA suspended all new purchases of tin for stockpile and announced that purchases by the government for industrial use would be held to a minimum. As of May 1, 1951, the National Production Authority took over the distribution of tin through allocation to consumers.

The price of tin had reached $1.82 in New York in Jan., 1951, but thereafter RFC sold at declining prices to U. S. consumers until at the beginning of Aug., 1951, the New York price was established at $1.03 per lb.

During this period there took place an actively vociferous controversy, between a Senate subcommittee and various departmental spokesmen on the one hand, and Bolivia and other producing countries on the other, as to what constituted a fair price for tin. The RFC, however, maintained its price at $1.03 for the remainder of 1951 and, although

Table II.—World Tin Production

(Thousands of long tons)

	Av. 1936-39	1951	1952 12 Mos. Ended Aug. 31
United States		30.9	16.9[1]
British Commonwealth			
Straits Settlements		65.9	63.5
United Kingdom	35.7	27.9	29.9
Others	3.0	2.5	2.5
Total Brit. Comm.	120.0	96.3	95.9
Belgium			
Belgium	5.1	8.4	9.3
Belgian Congo	2.4	3.0	2.9
Total Belgium	7.5	11.4	12.2
Netherlands	22.2	21.0	24.7
Indonesia	12.1		
Other Countries	17.2	7.9	7.4
World Total*	179.0	167.5	157.1

* Not including U.S.S.R.

1 The Longhorn smelter was closed by strike from June 1 to Aug. 18.

Table III.—Imports of Tin Into the United States

(Thousands of long tons)

	Av. 1936-39 Tin Metal	1951 Tin in Concentrates	1951 Tin Metal	1951 Total Tin	1952 12 Mos. Ended Aug. 31 Tin in Concentrates	1952 12 Mos. Ended Aug. 31 Tin Metal	1952 12 Mos. Ended Aug. 31 Total Tin
Imported from							
Bolivia		13.1		13.1	8.5		8.5
Belgian Congo	.2	1.6	.9	2.5	1.5	.9	2.4
Indonesia	3.8	11.7		11.7	8.2		8.2
Malaya	51.2		7.0	7.0		28.4	28.4
Thailand		3.1	.1	3.2	3.8		3.8
China-Hong Kong	4.7		.1	.1			
Belgium	.6		5.4	5.4		6.9	6.9
Netherlands	2.5		12.5	12.5		16.0	16.0
United Kingdom	7.4		1.8	1.8		6.9	6.9
Portugal					.6		.6
Other Countries	.6	.1		.1		.2	.2
Total	71.0	29.6	27.8	57.4	22.6	59.3	81.9

Table IV.—Industrial Use of Tin in U. S.

(Thousands of long tons)

	Av. 1936-39	1951	1952 12 Mos. Ended June 30
Tin Plate and Terne Plate	35.6	31.9	29.3
Solder	16.9	19.9	16.8
Bronze and Brass	5.8	22.0	19.6
Babbitt	5.8	5.4	5.2
Tubes and Foil	5.4	1.1	.7
Tinning	2.3	2.5	2.6
Miscellaneous	7.9	5.2	4.2
Total	79.7	88.0	78.4
Of Which—			
Primary	65.0	60.0	52.2
Secondary	14.7	28.0	26.2

Table V.—Stocks of Tin in the United States

(Thousands of long tons)

	1939 (Dec. 31)	1941 (Dec. 31)	1951 (Dec. 31)	1952 (June 30)	1952 (Aug. 31)
Consumers	15.1	56.9	11.0	10.4	
Government					
RFC recoverable					
Tin in concentrates			10.8	8.2	
Tin metal		50.0	8.6	15.9	
Permanent stockpile (est.)			148.2	166.2	173.2
Total Stocks	15.1	106.9	178.6	200.7	

world supplies were plentiful, restricted its purchases to a comparatively small quantity of Bolivian concentrates in September.

This log-jam on price was finally broken on Jan. 22, 1952, when RFC advanced its selling price for tin metal to $1.215 per lb., which price is still maintained. This rise was the result of an agreement with Great Britain under which the U. S. sold Britain 1,108,000 net tons of steel and Britain sold the U. S. 20,000 long tons of tin at $1.18 per lb. f.o.b. port of shipment (plus 15,000 metric tons of aluminum). Existing stocks of tin in the U. K. were used in part fulfillment of this agreement.

Subsequently RFC concluded other agreements for tin deliveries:

—With Indonesia, 18,000 to 20,000 long tons per year to be delivered during two years, of which more than half was understood to be in the form of pig tin, at $1.18 per lb. f.o.b. port of shipment.

—With Belgian Congo, 7,000 to 9,000 long tons per year to be delivered during two years, of which a small portion was understood to be in the form of concentrates, at $1.18 per lb. f.o.b. port of shipment.

—With Bolivia, 12,000 to 13,000 tons of tin in concentrates which had accumulated at Chilean and Peruvian ports since the contract of September, 1951.

In addition RFC bought from private sources at $1.20-$1.21 per lb. pig tin estimated to exceed 30,000 long tons.

On Aug. 1, private buying of tin at world prices for resale to consumers was once more permitted under an amendment to National Production Authority Order No. 8. Consumers, however, were still required to report to the NPA as to the amount received and held in inventory, and they had to certify that their purchases did not cause their total receipts to exceed their authorized allocations for use.

Simultaneously on Aug. 1, the U. S. and U. K. Governments announced their intention to remove the limitations upon private trading in tin, which had been stipulated in the "tin and aluminum for steel" agreement of Jan. 18, 1952, and to establish more normal arrangements for the conduct of this trade "as soon as possible."

In his statement in connection with the NPA announcement, GSA Administrator Larson said:

(Continued on page 240)

Table I.—U. S. Magnesium Output and Use Including Secondary
(Short tons*)

	1951	1952
Primary ingot produced	40,000	105,386
Primary ingot sold and used by producer:		
for magnesium alloys	28,500	34,000
for other non-magnesium use	11,000	16,000
Total	39,500	50,000
Secondary magnesium:		
Used in magnesium alloys	6,300	4,000
Used in other non-magnesium use	1,700	5,000
Total	8,000	9,000
Total consumption of primary and secondary	47,500	59,000
Magnesium cast and wrought products shipped	30,300	33,000

* Source: Estimated by The Magnesium Association

Magnesium

High-temperature alloys, use with cast iron, and cathodic protection point up growth of metal.

DR. J. D. HANAWALT
Manager
Magnesium Department
The Dow Chemical Co.
Midland, Mich.

WHILE PRESENT INTEREST in magnesium is largely concerned with national defense, a wide variety of consumer applications has been explored and evaluated, and some placed in production.

Consumption of the metal in the past year reached a total of about 50,000 tons, and, projected on average growth rate curve, will approach 150,000 tons in 10 years.

One of the most important factors responsible for the progress of magnesium as a structural metal has been the success in reducing costs of magnesium articles through the adaptation of modern metalworking methods in mass production operations, taking advantage of unique properties of magnesium and solving its problems.

Die casting and extrusion are probably the best examples of the advance which has been made. However, the production of semi-fabricated stock is only part of the problem, and the costs of shop and finishing procedures are important in the final price of the item.

Two decades ago magnesium was considered a specialty metal. Now, because of its two outstanding characteristics: potential availability, and workability, it is considered destined to become one of the world's common structural metals.

Three fundamental properties of magnesium determine its markets. First is its lightness. Aluminum is 1½ times heavier and titanium 2½ times the weight of magnesium. Due to low density and good strength-to-weight ratio, magnesium alloys are used structurally in many applications. The major portion of these alloys goes into aircraft, materials handling, transportation, machinery and tools, printing, textile, and other basic industries. Acceptance of magnesium in the automotive industry continues to increase. Service tests have indicated good performance of magnesium parts, and the economics of die casting magnesium are such that the magnesium can compete with other metals on a price basis.

Second, alloys possessing exceptionally good properties at elevated temperatures have been developed and are now in production for use on jet engines. These alloys are based upon a magnesium-zirconium-mischmetal content. A still newer alloy is now available containing zirconium and thorium. This alloy possesses outstanding properties at higher temperatures. There are also indications that interest in Al-Mg alloys is increasing.

Another metallurgical application is the addition of a small amount of magnesium to cast iron, a process which changes cast iron from a brittle, low strength material to the equivalent of malleable iron. Only 0.1% of magnesium is needed to accomplish this; yet, even at this low rate, production of this ductile cast iron consumed over 750,000 lb. of magnesium in 1951, and over a million lb. in 1952.

Third, the chemical activity of magnesium has led to its increasing use in the deoxidation and desulphurization of less active metals, such as nickel, lead, and steel. This chemical activity is also used in the Grignard reactions for the production of new materials like silicones.

Cathodic Protection

The position of magnesium in the electrochemical series, and its high electrochemical equivalent, accounts for its widespread use in cathodic protection. Today, magnesium anodes are protecting miles of underground pipe lines, steel piers, lead sheathed cables, and home water-heater tanks. The Maritime Commission, to protect the fleet of inactive ships, or "Mothball Fleet," is using approximately 3-million lb. of magnesium anodes each year. Based on this experience, a successful experiment was conducted on an active commercial cargo vessel. Approximately 75% protection was obtained with the first installation. With slight modification and further descaling of heavy rust by action of the anodes, 100% protection of underwater surfaces of ship hulls seems possible.

Another electrical application of magnesium has been in batteries. The practical utilization in batteries of the electrical properties of magnesium is primarily the result of the invention of magnesium bromide as an electrolyte. This was demonstrated in the laboratories. In the past year progress has continued with several million primary cells produced and being subjected to field tests.

E & M J Mc

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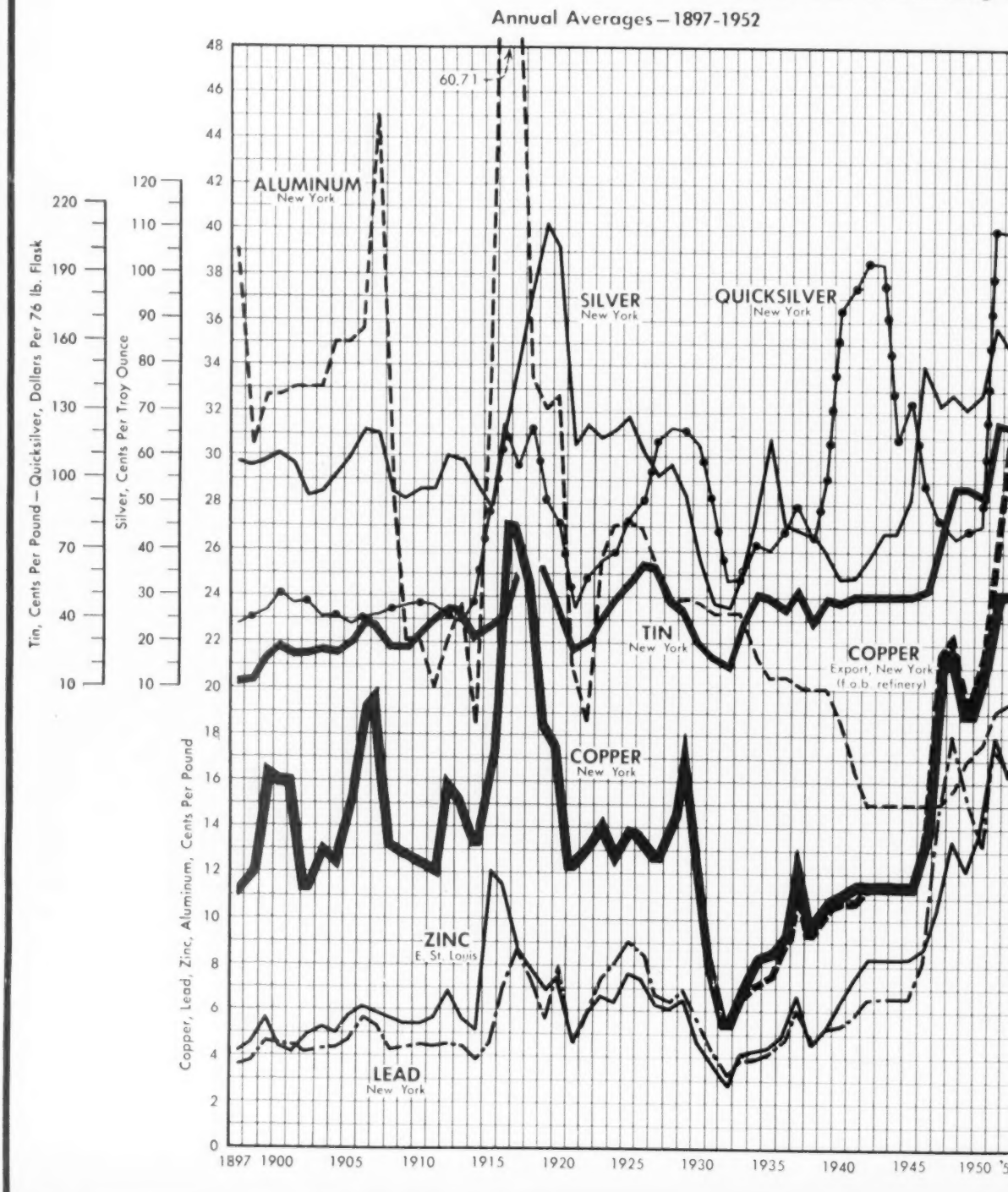


Metal Prices

ournal and E&MJ Metal and Mineral Markets

ng Company, Inc., New York

Weekly Averages—1952

E & M J Annual Average Metal Prices — 1897 to 1952

Year	COPPER, (a) Electrolytic Refinery	LEAD, Common, N. Y.	ZINC, Prime Western (b) E. St. Louis	TIN, (c) N. Y.	SILVER, (e) N. Y.	QUICKSILVER, (f) N. Y.
1897	11.29	3.580	4.120	13.67	59.790	38.50
1898	12.03	3.780	4.570	15.70	58.260	40.70
1899	16.67	4.470	5.750	25.12	59.580	43.63
1900	16.19	4.370	4.390	29.90	61.330	51.00
1901	16.11	4.330	4.070	16.74	58.950	47.00
1902	11.026	4.069	4.840	26.79	52.160	48.03
1903	13.235	4.237	5.191	28.09	53.570	41.32
1904	12.823	4.309	4.931	27.99	57.221	41.00
1905	15.590	4.707	5.730	31.358	60.352	38.50
1906	19.278	5.657	6.048	39.819	66.791	40.90
1907	20.004	5.325	5.812	38.166	65.237	41.50
1908	13.208	4.200	4.578	29.465	52.864	44.84
1909	12.982	4.273	5.352	29.725	51.502	46.30
1910	12.738	4.446	5.370	34.123	53.486	47.06
1911	12.376	4.420	5.608	42.281	53.340	46.54
1912	16.341	4.471	6.799	46.096	60.835	42.46
1913	15.269	4.370	5.504	44.252	59.791	39.54
1914	13.602	3.862	5.061	34.301(d)	54.811	48.31
1915	17.275	4.673	13.054	38.590	49.684	87.01
1916	27.202	6.858	12.634	43.480	65.661	125.49
1917	27.180	8.787	8.813	61.802	81.417	106.30
1918	24.628	7.413	7.890	88.750	96.772	123.47
1919	18.691	5.759	6.988	63.328	111.122	92.15
1920	17.456	7.957	7.671	48.273	100.900	81.12
1921	12.502	4.545	4.655	29.916	62.654	45.46
1922	13.382	5.734	5.716	32.554	67.528	58.95
1923	14.421	7.267	6.607	42.664	64.873	66.50
1924	13.024	8.097	6.344	50.176	66.781	69.76
1925	14.042	9.020	7.622	57.893	69.065	83.13
1926	13.795	8.417	7.337	65.285	62.107	91.90
1927	12.920	6.755	6.242	64.353	56.370	118.16
1928	14.570	6.305	6.027	50.427	58.176	123.51
1929	18.107	6.833	6.512	45.155	52.993	122.15
1930	12.982	5.517	4.556	31.694	38.154	115.01
1931	8.116	4.243	3.640	24.487	28.700	87.35
1932	5.555	3.180	2.876	22.017	27.892	57.93
1933	7.025	3.869	4.029	39.110	34.727	59.23
1934	8.428	3.860	4.158	52.191	47.973	73.87
1935	8.649	4.065	4.329	50.420	64.273	71.99
1936	9.474	4.710	4.901	46.441	45.067	79.92
1937	13.167	6.009	6.519	54.337	44.883	90.18
1938	10.000	4.739	4.610	42.301	43.225	75.47
1939	10.965	5.053	5.110	50.323	39.082	103.94
1940	11.296	5.179	6.335	49.827	34.773	176.86
1941	11.797	5.793	7.474	52.018	34.783	185.02
1942	11.775	6.481	8.250	52.000	38.333	196.35
1943	11.775	6.500	8.250	52.000	44.750	195.21
1944	11.775	6.500	8.250	52.000	44.750	118.36
1945	11.775	6.500	8.250	52.000	51.928	134.89
1946	13.820	8.109	8.276	54.544	80.151	98.24
1947	20.958	14.873	10.500	77.949	71.820	83.74
1948	20.038	18.043	13.589	99.250	74.361	76.49
1949	19.202	15.364	12.144	99.336	71.930	79.46
1950	21.235	13.296	13.868	95.539	74.169	81.26
1951	24.200	17.500	18.000	127.077	89.368	210.13
1952	24.200	16.467	16.215	120.473	84.941	199.097

(a) Lake copper 1897-98; domestic market since 1932. (b) New York delivery 1898-1902. (c) 99 percent in 1897 to 1920, inclusive; Straits quality thereafter. (d) Average for eleven months. (e) New York market. All quotations in cents per lb., except for silver, which are in cents per troy oz., and (f) quicksilver which are in dollars per flask of 76 lb.

E & M J Weekly Average Metal Prices — 1952

	COPPER Domestic Refinery	COPPER Foreign, Refinery	LEAD N. Y., Common	ZINC E. St. Louis Prime Western	TIN N. Y., "Straits"	SILVER N. Y., Foreign	QUICKSILVER N. Y.
Jan. 2	24.200	27.425	19.000	19.500	103.000	88.000	212.000
Jan. 9	24.200	27.425	19.000	19.500	103.000	88.000	208.000
Jan. 16	24.200	27.425	19.000	19.500	103.000	88.000	208.000
Jan. 23	24.200	27.425	19.000	19.500	109.167	88.000	206.000
Jan. 30	24.200	27.425	19.000	19.500	121.500	88.000	203.000
Feb. 7	24.200	27.425	19.000	19.500	121.500	88.000	203.000
Feb. 14	24.200	27.425	19.000	19.500	121.500	88.000	201.000
Feb. 21	24.200	27.425	19.000	19.500	121.500	88.000	201.000
Feb. 28	24.200	27.425	19.000	19.500	121.500	88.000	202.000
Mar. 5	24.200	27.425	19.000	19.500	121.500	88.000	207.000
Mar. 12	24.200	27.425	19.000	19.500	121.500	88.000	207.000
Mar. 19	24.200	27.425	19.000	19.500	121.500	88.000	207.000
Mar. 26	24.200	27.425	19.000	19.500	121.500	88.000	207.000
April 2	24.200	27.425	19.000	19.500	121.500	88.000	207.000
April 9	24.200	27.425	19.000	19.500	121.500	88.000	206.000
April 16	24.200	27.425	19.000	19.500	121.500	88.000	204.000
April 23	24.200	27.425	19.000	19.500	121.500	88.000	202.000
April 30	24.200	27.425	18.667	19.500	121.500	88.000	202.000
May 7	24.200	27.425	17.167	19.500	121.500	87.600	202.000
May 14	24.200	27.425	16.000	19.500	121.500	86.600	200.000
May 21	24.200	27.425	15.000	19.500	121.500	84.200	199.000
May 28	24.200	27.425	15.000	19.500	121.500	83.750	198.000
June 4	24.200	32.408	15.000	18.300	121.500	82.750	197.000
June 11	24.200	35.758	15.000	16.000	121.500	82.750	195.000
June 18	24.200	33.454	15.000	15.833	121.500	82.750	195.000
June 25	24.200	35.168	15.404	15.000	121.500	82.750	195.000
July 2	24.200	35.217	16.000	15.000	121.500	82.750	193.000
July 9	24.200	34.223	16.000	15.000	121.500	82.750	193.000
July 16	24.200	34.533	16.000	15.000	121.500	82.750	190.000
July 23	24.200	34.900	16.000	15.000	121.500	82.750	188.000
July 30	24.200	35.171	16.000	15.000	121.500	83.250	188.000
Aug. 6	24.200	34.808	16.000	14.750	121.500	83.250	187.000
Aug. 13	24.200	34.817	16.000	13.680	121.500	83.250	187.000
Aug. 20	24.200	35.025	16.000	14.000	121.500	83.250	187.000
Aug. 27	24.200	35.017	16.000	14.000	121.500	83.250	187.000
Sept. 3	24.200	34.575	16.000	14.000	121.500	83.250	187.000
Sept. 10	24.200	34.783	16.000	14.000	121.500	83.250	187.000
Sept. 17	24.200	34.996	16.000	14.383	121.500	83.250	193.000
Sept. 24	24.200	34.883	16.000	13.775	121.500	83.250	193.000
Oct. 1	24.200	34.904	16.000	13.692	121.500	83.250	191.000
Oct. 8	24.200	34.550	15.867	13.658	121.500	83.250	191.000
Oct. 15	24.200	34.746	14.600	13.525	121.500	83.250	191.000
Oct. 22	24.200	34.863	13.917	13.500	121.500	83.250	191.000
Oct. 29	24.200	34.875	13.500	12.771	121.500	83.250	191.000
Nov. 5	24.200	34.500	13.625	12.500	121.275	83.250	191.000
Nov. 12	24.200	34.792	14.125	12.500	121.225	83.250	193.000
Nov. 19	24.200	34.671	14.500	12.500	121.250	83.250	205.000
Nov. 26	24.200	34.879	14.500	12.500	121.417	83.250	209.000
Dec. 3	24.200	34.596	14.000	12.500	121.375	83.250	209.000
Dec. 10	24.200	34.996	14.000	12.500	121.500	83.250	212.000
Dec. 17	24.200	34.650	14.000	12.500	121.500	83.250	215.000
Dec. 24	24.200	34.788	14.125	12.500	121.500	83.250	218.000
Dec. 31	24.200	34.645	14.500	12.500	121.500	83.250	218.000

SELF-UNLOADING ore carrier, "Carl Schmedeman" will transport 15,000 tons of bauxite per trip from Reynolds Metals' Jamaica mines to the U. S.

Aluminum

1952 production missed the million mark, but expanding supply should catch up with soaring demand midway in 1953.

G. P. LUTJEN
Associate Editor

RECORD PRIMARY PRODUCTION, continued plant expansion, and a price increase featured the year in aluminum.

Total supply of aluminum in 1952 was about 1,355,500 tons, including 130,000 tons of imports (down 6,500 from 1951) and 288,500 tons of secondary metal (down 4,000). Not everyone could get all the aluminum he wanted in 1952 as military requirements continued to be the biggest single consumer, but men in the industry are saying that the tight supply for civilian uses should ease off by mid-1953 as new plants come up to full capacity. They indicate that steadily increasing demand in civilian use of aluminum products will more than offset any leveling off of military requirements in the next few years. To pinpoint a figure in the foreseeable future, there is fair agreement that total aluminum supply in 1954 will be about 2,120,000 tons per year, including imports and secondary production (about 1.6-million tons of this will be primary metal). This supply should fill both civilian and military needs and permit some stockpiling. How much will be stockpiled is the Munitions Board's secret.

In 1952, reduction plants established a new primary production record of approximately 937,000 tons, which easily betters the World War II peak of 920,000 tons in 1943. Production missed the million-ton mark predicted by many experts a year ago because of unusually severe droughts in the Pacific Northwest and South which resulted in the curtailment of available hydroelectric power. A critical metal shortage was avoided by the start of operations in three new plants and the increase in capacity of another. New production came from Alcoa plants at Rockdale, Tex., and Wenatchee, Wash., both with an annual capacity of 85,000 tons, and from Reynolds' Corpus Christi plant, capable of producing 75,000 tons of aluminum per year. At Alcoa's Point Comfort plant, the addition of 74 Nordberg gas-burning radial engine-generating units permitted an increase in capacity from 50,000 to 85,000 tons per year. These 1952 plant increases expand U. S. capacity by 280,000 tons per year.

Further increases of 374,000 tons in annual smelter capacity are due in 1953-54. Besides 55,000 more tons from Reynolds' new Arkansas plant, 5,000 tons more at Corpus Christi, and 100,000 tons at Kaiser's Chalmette plant (to bring capacity up to 200,000 tons), Anaconda's Montana plant should be producing at the rate of 50,000 tons per year. In addition, two newcomers, Olin Industries and Harvey Machine Co., plan to get in the aluminum business with 110,000-ton and 54,000-ton plants respectively.

Not included in this summation is Alcoa's fabulous Taiya project in Alaska. The company proposes to build a 200,000-ton plant at an estimated cost of $400 million to be privately financed. Water for hydroelectric power will come from high altitude Canadian lakes through a 13-mi. tunnel under Chilkoot Pass to Skagway power plants. Alco will first have to hurdle obstacles of acquiring title to the plant site and, even tougher, rights to dam and back up Canadian waters. From that point until the first production comes through will take about four years.

Alumina for the immediate expansion of smelter capacity will come from two new plants (Kaiser at Baton Rouge, and Aluminum Ore Co.'s 400,000-ton plant at Bauxite, Ark.), and the enlargement of two existing plants (Reynolds at Hurricane Creek and Aluminum Ore Co. at Mobile).

Cryolite

By mid-1953, the U. S. should no longer have to import cryolite, a *sine qua non* in aluminum smelting. Three reduction plants have started reclaiming cryolite from stockpiles of old pot linings. When stockpiles are cleaned up, plants will keep up with current production.

Cryolite Reclamation Plants

Plant	Annual Capacity
Lister Hill (Reynolds)	3,000 tons
Longview (Reynolds)	1,500 tons
Spokane (Kaiser)	5,400 tons

At the close of 1952 Aluminum Ore Co.'s East St. Louis synthetic cryolite plant began full scale production at the rate of over 10,000 tons per year. In Florida, Virginia-Carolina Chemical Co. will have a synthetic cryolite plant of 5,000 tons capacity in operation by June, 1953. Cryolite will be made from

the by-products of the company's other chemical plants. The only ingredient to be purchased is soda ash. Actual production will be about 3,900 tons per year unless Virginia-Carolina buys by-products from other plants.

It is interesting to note that reduction plant technologists are gradually overcoming their preference for natural cryolite. The only actual advantage now claimed for the natural material is that its greater stability makes starting up a potline easier. Purity of natural cryolite is somewhat higher, but the difference is negligible. Cryolite is not being stockpiled now, but a stockpile program is being considered.

Technology

Aluminum trade secrets are probably guarded more closely than in any other part of the mineral industry with the possible exception of uranium. When you talk about the size of pots, the aluminum metallurgist becomes very vague and only once in a while do you get so much as a hint that the companies are experimenting with pots bigger by far than any yet in production. The point is that one big pot presents less surface for heat radiation losses than two little pots, but just how big can you build them? One plant is sinking its pots in the ground to cut down heat loss.

The trend to larger units is revealed in comparing the 18,000 ton capacity (per year) potlines built during World War II with the fact that one potline now under construction today has a capacity of 54,000 tons.

In France and Sweden reduction plants have gotten down to a power consumption of 7.5 kw. hr. per lb. of aluminum using vertical pin pots. This compares with consumption closer to 10 kw. hr. per lb. in most U. S. plants, although new plants in this country are getting the 7.5 figure with the larger units.

Price

On Aug. 4, 1952, the government allowed a 1¢ increase in the price of aluminum to bring the price to 20¢ per lb., still a penny short of the producers' request. This concession was the first increase allowed since Oct. 1950, despite steadily rising production costs.

While aluminum for civilian use has been curtailed, a number of developments presage a strong demand when restrictions are lifted. For example, a spokesman in the DPA Office for Aluminum stated, "No major utility is using copper wire for new installations." Exceptions occur where tying into existing copper facilities would involve an inordinate expense. Or where installations are servicing copper producers, like Anaconda requesting copper wire at Yerington when aluminum had originally been planned. As a matter of fact, however, Anaconda and other copper producers are getting into aluminum fabrication and several have been requesting steadily increasing allotments to produce #4ACSR, the aluminum wire that competes with copper on transmission lines. Aluminum advantages include a cheaper first cost for equivalent conductivity and a 50% greater spacing required for line supports. Aluminum wire is also being tried on telephone systems and two of the largest turbogenerators ever built will have aluminum field windings.

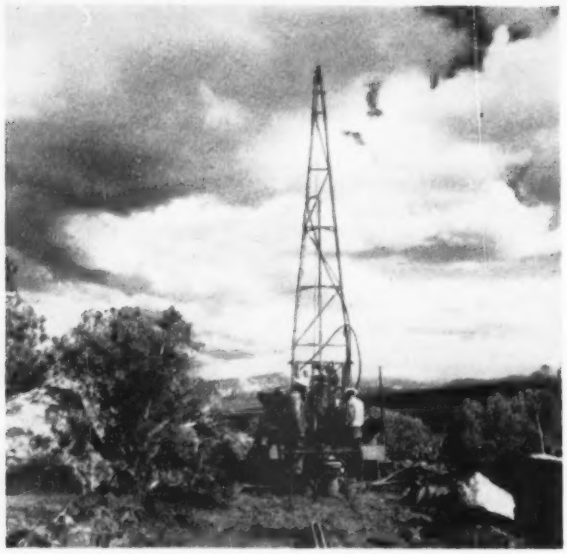
Light weight and rust resistance are making aluminum attractive to bus and truck operators where lower maintenance costs may defray higher first cost. Aluminum pistons are now standard on U.S. passenger cars, and experience with lightweight engines for military engines may soon lead to the use of aluminum for cylinder heads and certain castings in civilian auto engines. Although first attempts at using aluminum radiators on cars were not entirely successful, newly developed alloys and fabricating methods promise better results.

In building, at least three cities have or soon will have aluminum clad skyscrapers, and structural possibilities of the light metal continue to mount.

Primary Aluminum Capacity in the United States

(In Thousands of Tons per Year)

Company and Plant Location	In Operation December, 1952	To Be Completed in 1953-54	Total
ALUMINUM COMPANY OF AMERICA			
(Regular operation)			
Alcoa, Tenn.	145.3		145.3
Vancouver, Wash	76.1		76.1
Massena, N. Y.	59.0		59.0
Point Comfort, Texas	85.0		85.0
Badin, N. C.	33.9		33.9
Wenatchee, Wash.	85.0		85.0
Rockdale, Tex.	85.0		85.0
Total	569.3		569.3
(Temporary operation)			
Badin, N. C.	13.6		13.6
Massena, N. Y.	63.5		63.5
Alcoa, Tenn.	10.1		10.1
Vancouver, Wash.	8.9		8.9
Total	96.1		96.1
Total (all plants)	665.5		665.4
REYNOLDS METALS CO.			
Jones Mill, Ark.	95.0		95.0
Troutdale, Ore.	78.0		78.0
Listerhill, Ala.	50.0		50.0
Longview, Wash.	50.0		50.0
Corpus Christi, Tex.	75.0	5.0	80.0
New Arkansas Plant		55.0	55.0
Total	348.0	60.0	408.0
KAISER			
Spokane, Wash.	177.0		177.0
Tacoma, Wash.	33.2		33.2
Chalmette, La.	100.0	100.0	200.0
Total	310.2	100.0	410.2
ANACONDA			
Kalispell, Mont.		50.0	50.0
OLIN INDUSTRIES		110.0	110.0
HARVEY MACHINE CO.		54.0	54.0
Grand Totals	1323.6	374.0	1697.6
Total Regular Capacity (Excluding temporary)	1227.5	374.0	1601.5



DIAMOND DRILLING and wagon drilling for ore is going on at the rate of about 2-million ft. annually.

Uranium

BURT MEYERS
Grand Junction
Colo.

IN LESS THAN FIVE YEARS since the Atomic Energy Commission gave the green light to private enterprise for the production of uranium ore and concentrates, America has become the second largest producer of uranium among the free nations. Belgian Congo is first; Canada, third.

In the Colorado Plateau area, major domestic source, there are now more than 200 active uranium mines, ranging from small one-man operations to mines employing 100 men or more. U. S. Vanadium Co. alone has 50 properties operated for it by contractors, and purchases ore for its two mills from 90 independently operated mines.

More than 5,000 persons are now employed in the area in the following activities: mining, 1,000; milling, 1,000; construction and related activities, 2,000; drilling and exploration, 250; trucking, 150. Another 700 persons are employed by the AEC, including nearly 300 who carry out exploration programs for the AEC and USGS.

Number of mills in the area has grown from two in 1948, to eight operating mills today. Another is under construction and plans are under way for two others. In addition, buying depots have been established at five widely scattered points, with another scheduled for construction in 1953.

Outlook

• "It is my own belief that the use of uranium for power purposes will become economically feasible before the need for uranium for military purposes begins to slack off. Therefore, I believe that there is going to be a continuing demand for uranium." — A.E.C. Commissioner Henry D. Smyth before the American Mining Congress at Denver, Colo., Sept. 25, 1952.

• The Navy will be substantially converted to atomic power during the next 10 years according to reported predictions by Secretary of the Navy, Dan Kimball, who disclosed that at least eight of the twelve 60,000-ton Forrestal class carriers to be built by the Navy will have atomic power plants. The Navy plans to build them at the rate of one a year.

Diamond and wagon drilling by private companies is going on at the rate of about $3-million for 2-million ft. annually. U. S. V. alone accounted for 108,000 ft. of wagon drilling and 160,112 ft. of diamond drilling on its own properties in 1951. Another firm, Minerals Engineering Co. of Grand Junction, Colo., drilled some 400,000 ft. in 1951. Other firms active in the area are Joy Drilling Co. and Pennsylvania Drilling Co. Government-sponsored drilling in 1951 amounted to 1.3-million ft., with 1.5-million ft. scheduled for 1952 fiscal year. AEC and USGS drilling is contracted by private firms.

$30-Million Expenditures

Conservative estimates by U. S. V. place the annual rate of spending in the Plateau uranium industry at more than $30-million for payrolls, services, equipment, and materials. U. S. V. spent $6-million in the Plateau in 1951, exclusive of ore purchases. Figures for 1952 are not available but it is estimated that overall expenditures will have increased by about one-third for the area.

The value of uranium produced may not be disclosed, but various unofficial estimates place the figure in excess of Colorado's molybdenum output, valued at $22.5-million for 1951. Even though these figures are conjectural, the fact remains that uranium mining on the Plateau has bolstered the economy of this area substantially. All of this progress has been directly due to AEC's vigorous program to sponsor uranium production, and private industry's willingness to pour millions into ventures in the area.

Buying schedules for uranium ores set up by AEC have been widely publicized including bonuses and allowances of various sorts to stimulate production. (See *E&MJ*, Jan., 1952.) Bonus payments to stimulate new production totaled nearly $1-million by Dec. 1, 1952.

The largest uranium ore treatment mill in the U. S. is the Uravan plant owned by U. S. V. Capacity has been doubled in a half-million-dollar project completed recently. Expansion involved the construction of thickening and solution tanks of about 40,000-gal. capacity, new roasters, additional filtering equipment, and enlargement of the sampling plant. A new process developed by U. S. V. permits the Uravan plant to handle high-lime uranium ores. In an announcement during the year Walter E. Rem-

mers, president of U. S. V., said that by virtue of the new process which is expected to overcome problems encountered in processing these ores, there should be "considerable expansion of mining throughout the whole area."

Other companies operating mills have expanded capacities also. Vanadium Corporation of America enlarged its Durango plant by 40% in late 1951. In Nov., 1952, it announced that the plant would be expanded another 30%. V. C. A.'s 1951 expansion involved construction of a new 200-ton ore roaster at a cost of about $150,000. Vitro Chemical Co. is doubling capacity of its mill in Salt Lake City which treats non-carnotite ores from Marysvale, Utah, and low vanadium-content ores from the Temple Mountain district in southern Utah. The original capacity of the Climax Uranium mill at Grand Junction has been increased since the mill first went into operation in mid-1951.

On Dec. 8, 1952, the AEC announced that V. C. A. will build a new mill at Hite, Utah, where the company has operated a pilot plant in developing processes to extract uranium from copper-bearing ores. The new mill will use methods proved in the pilot plant, and will cost between $1.5-million and $3-million. Confirming AEC's announcement, Dennis W. Viles, V. C. A. vice president, stated: "There is a large tonnage of low-grade uranium-copper bearing ore in White Canyon and Red Canyon adjacent to the Hite, Utah, plant. V. C. A. pioneered the development of processing this ore which caused considerable mine exploration and development work in bringing the properties up to a sizable developed tonnage as of today."

Still in the planning stage, but with construction expected to start soon, is a $2.75-million uranium mill at Shiprock, N. M. Navaho Uranium Co., owned by Kerr-McGee Oil Industries, Inc., will build and operate the plant, which will draw its ore from mines on the Navaho Indian reservation.

Ore buying depots have been established at Shiprock, N. M.; Monticello and Marysvale, Utah; and a new one at Edgemont, S. D., which started to accept ores from the new South Dakota mining area on Dec. 1, 1952. Another buying station is located at Thompson, Utah, and a new one is to be built for the AEC at Greenriver, Utah.

In addition to companies operating processing mills, many companies are active in mining. Included in this group are: Dulaney Mining Co., J. R. Simplot Co., Inc., Plateau Mines, Inc., Consolidated Uranium Co., Skidmore Mining Co., LaSal Mining Co., Excalibur Mining Corp., White Canyon Mining Co., Uranium Company of America, and others.

From the number of new companies coming into the Plateau area, plus the amount of expansion going on, it is quite evident that the outlook for the future of the area is favorable. In the opinion of Dennis Viles of VCA, "There is a far greater ore supply in sight than at any time of our company's long years of operation."

Another indication of uranium's importance to the mining industry generally is pointed up by the fact that AEC's overall budget for the procurement of raw materials has increased from $35.5-million in 1948 to an estimated $148-million for 1953.

Activities at Grants

"A healthy young industry has gotten off to a good start in Northwestern New Mexico" is the way J. B. Knaebel, manager of New Mexico operations for Anaconda Copper Mining Co. summarized developments in the new productive Grants area in a paper presented at the Southwest Mineral Conference in Albuquerque in November. Following the discovery of uranium in the Todilto limestone near Grants in the fall of 1950, exploration got off to a fast start in the area. The Santa Fe Railroad and Anaconda Copper Mining Co. had men in the field before the year ended. After extensive exploration work in 1951, involving the use of airborne radiometric equipment, Anaconda at the request of AEC agreed to construct a plant near Bluewater, some 10 mi. west of Grants, N. M., for the recovery of uranium oxide from the limestone ores in the area. In March 1952, Anaconda entered into a second agreement with AEC to operate a temporary sampling plant and stockpiling depot on a non-profit basis at Bluewater. This definitely stimulated mining in the area and a number of operations started producing and shipping to the depot.

Construction of the Bluewater leaching plant started early in 1952, and is expected to operate by mid-1953. Crushed ore will be reduced in ball and rod mills, then subjected to a continuous leaching process using hot solutions of mixed sodium carbonate and bicarbonate, followed by precipitation of the uranium oxide with sodium hydroxide. The pulp will be filtered on Burt filters.

1952 Uranium News Around the World

South Dakota. New discoveries of carnotite orebodies were made north and northwest from the vicinity of Hot Springs and Edgemont. Claim staking very active. New ore-buying station received shipments starting Dec. 1, 1952.

Florida Phosphate Deposits. Metallurgical research has developed a process for the recovery of by-product uranium from phosphate rock. Production from first plant now under way.

Lignite. Exploratory and development drilling is in progress at large uraniferous lignite deposits in Wyoming and South Dakota.

Africa. Belgian Congo is still the premier source of uranium. Metallurgical research on recovery of uranium from tailings of gold ores of South Africa is now paying off. Thirteen mines are participating in a uranium recovery program, and more are expected to follow. West Rand Consolidated's £1.6-million uranium extraction plant was formerly opened Oct. 8, 1952. Prime Minister D. F. Malan reported that cost of present extraction program including sulphuric acid plants would run about £40-million, and estimated that annual gross revenue from uranium recovery operations would run about £30-million.

Australia. Biggest news of the year pertained to uranium discoveries made in the Rum Jungle area a 200-mile belt stretching from Darwin to Katherin in Northern Territory, which optimistic press reports says may yet prove to be one of the richest and largest uranium deposits in the world. In Jan., 1953, the U. S. Atomic Energy Commission signed an agreement with the U.K. and the Australian Government related to the recovery of uranium from this area.

A similar agreement was signed in 1952 covering the development and exploration of the Radium Hill deposit in South Australia. Production in appreciable volume is not expected from this source until late 1953 or early 1954. Radium Hill is reported to be the hub of another uranium area.

Canada. Production still comes solely from Eldorado's Port Radium property at Great Bear Lake. The mill has been renovated, and a $1.5-million leaching plant completed to treat mill tailings. Mid-1952 saw the greatest staking rush in Saskatechewan's history when the Beaverlodge uranium field was opened to public staking. Eldorado's 500-ton unit of a 2,000-ton production plant at Beaverlodge is scheduled to start production soon.

Minor Metals

Improved supply and relaxation of government controls marked development in most minor metals. Prices generally lower in 1952. Trends in production and consumption were mixed.

CHARLES WHITE MERRILL
Assistant Chief, Minerals Division, Bureau of Mines.

Antimony

ABBOTT RENICK
Commodity Specialist
Bureau of Mines

AS A RESULT of slackening demand and reduced prices, Bradley Mining Co., Stibnite, Idaho, principal domestic producer, discontinued mine production of antimony in June, 1952 and the smelter was shut down in August. These developments placed the United States' self-sufficiency figure at about 13% in 1952.

Effective May 15, 1952, the National Production Authority revoked Order 39 (antimony) restricting consumption and stocks. However, monthly reporting on the production, receipts, consumption, shipments and inventories of antimony (in excess of 1,999 lb. of contained antimony) was retained on a mandatory basis.

The 1952 supply of primary antimony and industrial consumption were expected to be about 15,000 short tons. Smelter production in the United States was estimated at about 11,000 tons against 12,228 tons in 1951. In addition, about 2,300 tons of antimony in domestic were recovered, compared with and foreign silver and lead ores 2,356 tons in 1951. Recovery of secondary antimony was expected to approximate 21,000 tons, 9% below 1951.

Imports of contained antimony in ore were estimated at 7,700 tons compared with 11,905 tons in 1951. Imports of metal and antimony in oxide were expected to be about 4,500 tons compared with 3,923 tons in 1951.

As of Sept. 30, 1952, total stocks of antimony (monthly canvass) were 14% less than the 8,644 tons reported on Jan. 1, 1952.

Price Drops During 1952

Ceiling prices for carlots of 99½% antimony metal, Laredo, Texas at 50¢ per pound, were maintained from Jan. 1, 1952 to Apr. 24, 1952. Effective Apr. 24, National Lead Co. announced a reduction in the price of antimony from 50¢ to 44¢ a pound. The latter price was quoted until May 19, when the leading smelter reduced its quotation for 99½% antimony metal to 39¢ per pound effective May 20. Lower ore prices and increased foreign competition caused the break in metal prices. A further 4½¢ price cut became effective on Nov. 3, 1952, to some extent related to the fact that foreign metal was arriving at levels considerably below the domestic quotations.

Quoted prices for all grades of antimony ore fell steadily, dropping (for the 60-65% grade) from $6.75-$7.00 a unit, Jan. 3, to $3-$3.25, Nov. 20.

Antimony

Short Tons

	1951	*1952 Estimated*
Domestic mine production	3,512	2,000
Imports	15,828	12,200
Exports	168	175
Consumption	17,519	15,000
Average price of antimony metal, in bulk, f.o.b. at Laredo, cents per pound	42.35	42.06

Beryllium

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Commodity Industry Analyst
Bureau of Mines

NEW USES FOR BERYLLIUM in connection with the Atomic Energy Commission program, and increased requirements of Beryllium-copper alloys for defense have resulted in a greater demand for this metal. Record prices for beryl, only commercial sources of beryllium, were established in 1952. A Dec. 18 quotation was as follows: Per unit BeO contained 10-12% f.o.b. mine, Colorado, $45 to $48, depending on quantity; imported ore, per unit BeO, c.i.f. U.S. ports basis 10%, $45; 11%, $47; 12%, $48.

In October, General Services Administration announced a program for the purchase of beryllium ore from small domestic producers. Purchase depots were established at Custer, S. D., Franklin, N. H., and Spruce Pine, N. C. Shipments up to 500 lb. of beryl concentrates are purchased on the basis of visual inspection at a flat price of $400 per ton The price of ore subjected to chemical analysis per short ton unit of BeO is as follows: 8.0 to 8.9%, $40; 9.0 to 9.9%, $45; 10% or more, $50.

The Defense Mineral Exploration Administration's program resulted in several significant beryl discoveries. Domestic production of beryl for 1952 is expected to reach the all-time high of 559 tons for 1950. Imports for the first 10 months of 1952 were nearly 5,000 short tons averaging plus 10% BeO. Over 2,000 tons came from Brazil, the balance from Union of South Africa, Southern Rhodesia, French Morocco, Mozambique, Argentina, India and Portugal.

Beryl Statistics

Short Tons of Beryl (10% BeO)

	1951	1952 (estimated)
World production	5,590	7,000
Domestic Production	404	550
Imports to United States	4,316	5,500
Price per contained Short Ton Unit of BeO	Dec. $33-$37 (8% to 12% BeO)	Dec. $40-$50

Platinum Group

JAMES E. BELL
Commodity Industry Analyst
Bureau of Mines

A TENTATIVE ESTIMATE of the world production of platinum-group metals in 1952 by countries is as follows: Canada 310,000 oz. troy; South Africa 240,000; U.S.S.R. 100,000; United States and Alaska 34,000; Columbia 30,000; miscellaneous 1,000; total 715,000.

Domestic demand for platinum exceeded supply, due to large requirements in military and defense industries. Noteworthy were expansions in use of platinum as a catalyst for producing high-octane gasoline, and in the manufacture of fiber glass. NPA Order M-54 adopted on Apr. 1, 1951, prohibiting sale or purchase of platinum for investment or for jewelry or decorative uses (finished parts in inventory excepted), continued in effect through 1952. An amendment of Order M-54 adopted on Aug. 14, 1952 permits manufacturers of jewelry and other items on the prohibited list to receive from refiners for re-use all platinum recovered from the manufacturers' platinum scrap. Effective April 26, 1952, a ceiling price for platinum of $93 per fine troy oz. was established by OPS; however, until July 27, 1952 sellers could make shipments at prices up to $105 per oz. The Waterval (Rustenburg) Platinum Mining Co., Ltd., operating in South Africa, enlarged its mining and plant facilities and increased production in 1952, and further expansion is expected in 1953.

Imported refined platinum plus domestically refined platinum totaled 192,000 oz. troy during the first nine months of 1952, compared with 175,000 oz. for the same period of 1951. Making the same comparison, domestic sales plus exports were 160,000 oz. and 162,000 oz., respectively. Sales data indicate a distribution by uses for platinum domestically consumed in the first nine months of 1952 as follows: chemical 59%, electrical 32, dental and medical 7, jewelry and decorative 1, and miscellaneous 1. The government purchased platinum for stockpiling, but the quantity is not reflected in the figures given. Stocks of platinum of refiners and dealers declined moderately during the first nine months.

Demand for palladium continued at an unusually high level. In the first nine months of 1952 refined imported palladium plus palladium domestically refined totaled 175,000 oz. compared with 202,000 oz. in the corresponding period of 1951. Domestic sales and exports together were 151,000 oz. as against 198,000 oz. Of the domestic consumption, 11% was used for chemical purposes, 56 for electrical, 14 for dental and medical, 18 for jewelry and decorative, and 1 in miscellaneous applications. The retail price of palladium remained unchanged at $24 per fine troy oz. in 1952.

Sales of iridium, osmium, rhodium and ruthenium together in the first nine months of 1952 were 14,000 oz. compared with 26,000 oz. in the same period of 1951. The largest user was the chemical industry. Iridium was purchased by the government for stockpiling, but the quantity is not included in the figures given. Prices of osmium, rhodium, and ruthenium were $200-$210, and $125, and $93, respectively, per oz. in 1952. Iridium was quoted at $200 to early in November, then at $175-$185 briefly, and at $185-$200 thereafter.

U. S. Titanium Statistics in 1952

In Short Tons

	Ilmenite[1]	Titanium Slag[2]
PRODUCTION:		
Gross Weight	537,000	43,500
TiO_2 Content	273,000	31,300
SHIPMENTS:		
Gross Weight	523,000	38,800
TiO_2 Content	266,000	28,000
IMPORTS:[4]		
Gross Weight	158,660[6]	38,700[5]

[1] Production and shipment figures include 10 months actual and estimates for November and December.
[2] Titanium slag reported is produced by the Quebec Iron & Titanium Corporation, Sorel, Can. These figures include 11 months actual and an estimate for December.
[4] In addition 15,518 tons of rutile were imported during the first nine months of 1952.
[5] Titanium slag was imported from Canada and is included in ilmenite imports.
[6] Includes imports for January to September, inclusive.

Titanium

A. F. TUMIN
Commodity-Industry Analyst
Bureau of Mines

TITANIUM SPONGE PRODUCTION in 1952 is estimated at 2,200,000 lb. approximately double the 1951 output, coming from plants operated by E. I. Du Pont de Nemours at Newport, Del.; Titanium Metals Corporation of America at Henderson, Nev.; and the Crane Co., Chicago, Ill. The Bureau of Mines continued process research at its Boulder City, Nev. pilot plant.

The Defense Materials Procurement Agency contracted with Du Pont, July 28, 1952, for additional production of 13,590 short tons of titanium sponge during the next five years. The government will advance the company up to 14.7-million to bring capacity of its Newport, Del., plant to 10 tons per day. The money is to be paid back, with interest, as salable titanium sponge is produced by expanded facilities. This agreement with DuPont is similar to one that the government made with Titanium Metals Corp. in Aug., 1951, which calls for the production of 18,000 short tons of titanium sponge over a five-year period. Plans for additional expansion by present and new producers were under consideration by DMPA at the close of 1952 to meet the goal set by DPA of 22,000 tons by the end of 1955.

New titanium organizations were formed in 1952. Glidden Co., of Cleveland, and Bohn Aluminum and Brass Corp., of Detroit, joined forces by combining their research facilities to develop a cheap method of producing pure titanium metal, its compounds and alloys, and for the fabrication of ductile titanium and its alloys. The Titanium Company of America, East Chicago, Ind., was organized by the Christiansen Corp., of Chicago, and reported plans for the construction of facilities for the manufacture of wrought products from titanium. Kennecott Copper Corp. constructed a pilot plant at the Battelle Memorial Institute, Columbus, Ohio, in 1952, to evaluate a new process for production of titanium metal.

At the National Metal Exposition, at Philadelphia, Pa., Oct. 22, 1952, Rem-Cru displayed for the first time a titanium ingot weighing 4,000 lb. and a continuous sheet of titanium coil, .015 in. thick, 460 ft. long and worth $12,000. A model of the J-47 Air Force engine high-

lighted the uses of titanium in blades, casings, compressor wheels, and other components. Titanium was displayed in the following forms: .38 calibre paratrooper's pistol, filters, cutting tools, valves, and other machine parts. An organic bonding agent ideal for low-heat bonding of titanium also was revealed. Worcester Pressed Steel Co., Worcester, Mass., demonstrated that parts can be drawn from commercially pure titanium.

Pigment Production Drops

Titanium pigment production and shipments in 1952 decreased 5 and 16%, respectively, under 1951, as production dropped to about the 1950 level and shipments fell to near the 1948 figure. In April DPA announced an expansion goal for titanium dioxide pigments calling for an annual production capacity of 370,000 short tons by Jan. 1, 1954, with tax amortization certificates provided for the required added capacity. National Lead Co. reported on July 1, 1952, that it acquired all the capital stock of Titangesellschaft m.b.H. of Leverkusen, Ger. This plant produced titanium dioxide pigments for European consumption.

Domestic production of ilmenite in 1952 of 537,000 short tons, containing 273,000 tons of TiO_2, was virtually the same as in 1951. The Glidden Co. reported that its plant, Yadkin Mica and Ilmenite Co., Finley, N. C., ceased production of ilmenite in Oct., 1952. Baumhoff-Marshall, Inc., Boise, Idaho, in 1952, doubled the 1951 recovery of ilmenite from its monazite operations. Florida Ore Processing Co., Melbourne, Fla., tripled its 1951 output of ilmenite. National Lead's Tahawus, N. Y., property continued as the world's largest ilmenite producer. E. I. Du Pont at Starke, Fla.; Rutile Mining Co., Jacksonville, Fla.; American Cyanamid Co. at Piney River, Va., and the Yadkin Mica and Ilmenite Co. at Finley, N. C., showed slight decreases in ilmenite production in 1952. Shipments totaled 523,000 short tons containing 266,000 tons TiO_2 and increased slightly over 1951. The product produced by E. I. Du Pont at Starke, Florida, classified as ilmenite, included a mixed product containing ilmenite, rutile, and leucoxene.

Imports of ilmenite for January to September 1952, inclusive, were 158,660 short tons, slightly less than that received in the first nine months of 1951 (164,170 short tons). India continued to dominate the suppliers of ilmenite to the United States in 1952. Canadian ilmenite import figures included titanium slag in 1951 and 1952. In 1952, titanium slag production, by the Quebec Iron and Titanium Corp., Sorel, Que., and shipments to the United States is estimated at 43,400 and 38,700 short tons, respectively. The titanium slag is reported to contain 72% TiO_2.

Domestic production of rutile in 1952 decreased slightly under 1951. Rutile was produced by two companies in Florida, the Rutile Mining Co. at Jacksonville, and the Florida Ore Processing Co. at Melbourne.

Imports of rutile from Australia, sole supplier since 1947, were reported at 15,518 short tons in the first nine months of 1952, 7,204 tons over receipts in the same period of 1951. Rutile was consumed chiefly for welding-rod coatings with smaller quantities for alloys and carbide, ceramics, titanium metal and fiberglass.

Quotations per gross ton for ilmenite, containing 56 to 59% TiO_2, f.o.b. Atlantic seaboard were $16 to $18 at the beginning of 1952 and increased to $16 to $20 in March and to $18 to $20 in April, at which level the price of ilmenite remained for the rest of the year. All quotations were nominal.

Nominal quotations for rutile guaranteed minimum 94% concentrates were 3½ to 4½¢ per pound at the beginning of the year and increased to 7 to 8½¢ a pound in Nov., 1952.

Arsenic

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THE ARSENIC PRODUCED in the United States is recovered as arsenious oxide, (arsenic trioxide), or white arsenic. Production is directly related to the volume of copper and lead ores smelted. On the basis of nine-months' production figures, it was estimated that the total domestic production of crude and refined arsenic would not exceed the 15,485 short tons reported in 1951.

Imports, mostly arsenic trioxide, for nine months were estimated at 3,300 short tons, compared to 14,518 in all of 1951. Of this, 93% of the trioxide came from Mexico. Imports of metallic arsenic for the first nine months totalled 25 tons.

White Arsenic

Short Tons

	1951	1952 Estimated
Production	15,485	14,000
Imports	14,518	4,300
Apparent Consumption	28,869	14,000
Average price per pound	.06½¢	.06½¢

Apparent consumption of white arsenic in 1952 was expected to be less than in 1951, because of the increased use of organic insecticides. Extended droughts and generally hot and dry climatic conditions prevailed in the cotton belts which further decreased the use of insecticides.

On Jan. 1, 1952, the market price for arsenious oxide, refined, white, minimum 99% was 6¢ per pound, in barrels carload lots delivered. Effective June 16, the price was reduced to 5½¢.

Cadmium

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THE MOST NOTABLE FEATURE in the cadmium industry was the increase in stocks of metal producers, compound manufacturers, and distributors from about 1,123,000 lb. Dec. 31, 1951 to 1,700,000 lb. Dec. 31, 1952. Apparent consumption of primary cadmium, nevertheless, increased to about 8,500,000 lb in 1952, 19% higher than in 1951. This seemingly anomalous situation was due to increased production and greatly expanded imports.

Production of cadmium metal in the United States in 1952 increased 2% to an estimated 8.4-million lb., most of it coming as a by-product from zinc reduction operations. About 45% of the primary cadmium metal produced is of foreign origin, obtained from imported flue dust and imported zinc and lead ore and concentrates. Mexico is the chief source, followed by Canada,

Cadmium
Pounds

	1951	1952
		(Est.)
Production	8,250,895	8,400,000 (10 mos.)
Imports (metal)	90,065	874,581 (10 mos.)
Exports (metal)	606,233	298,238
Average price, commercial sticks, New York	$2.55	$2.24

Peru, and then Southwest Africa.

Imports of metallic cadmium for consumption increased to an estimated 1,050,000 lb., as compared with 90,065 for 1951. For the 10-month period, Belgium Luxembourg supplied 70%, Japan 21%, Australia 8%, and Germany 1%. Imports of cadmium-bearing flue dust, chiefly from Mexico, increased 25% to about 2-million lb.

The cadmium conservation order, M-19, restricting the use of cadmium to the production of essential war and civilian goods, was revoked on May 15.

The quoted New York price of $2.55 a lb. for commercial sticks of cadmium effective through May 14, was reduced in three cuts during 1952 to $1.75 to $2.00 per lb.

Mercury

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MERCURY CONSUMPTION failed to reach anticipated peacetime record levels in 1952 chiefly because a completed large chlorine and caustic soda plant, using mercury cells, did not get beyond the test-run stage. There was expansion of mercury cell chlorine capacity in 1952, however, both because of new plants and of extensions of old plants. Incomplete data indicated that imports increased substantially over the high rate in 1951 and were exceeded in the entire history of the industry only in the years 1945 and 1949. Despite prices that were considered by some observers to be high, domestic production did not advance in 1952 over the rate for the final quarter of 1951. The total for 1952, 12,400 flasks, however, was 70% higher than the small quantity in 1951.

Imports and production together, plus stocks accumulated for mercury electrolytic unit installations, were more than adequate for all needs.

The new chlorine and caustic soda plants that began to produce in 1952 are at McIntosh, Ala., and Plymouth, N. C. Other uses, for the most part, took smalled quantities of mercury in 1952 than in 1951. An exception was the quantity dissipated in the electrolytic production of chlorine and caustic soda, as distinguished from that withdrawn from stocks for plant installations; the latter may be reclaimed and used for another purpose if conditions warrant.

Of domestic production California supplied over 55% of the total, Nevada nearly 30, and Oregon and Nevada together about 15. Leading producers were the New Idria (including San Carlos), San Benito County, Mt. Jackson (including Great Eastern), Sonoma County, and Abbott, Lake County, in California; Hermes, Valley County, Idaho; Cordero Mine, Humboldt County, Nevada; and Bonanza, Douglas County, Oregon.

In the first 10-months of 1952 imports totaled 61,000 flasks. Spain supplied 34%, Italy 40%, Yugoslavia 15%, and Mexico about 11%.

Industrial stocks of 30,000 flasks at the beginning of 1952 were above normal in anticipation of the new chlorine expansion. On Sept. 30 these stocks continued unchanged at 30,000 flasks, but a substantial part of the total was in a large chlorine installation not yet in production and the metal is not available for purchase. These figures exclude stockpiled metal.

Partly as a result of the availability in the first three quarters of the year of more mercury than was being consumed, the price quotation for this metal declined. It averaged $215 in the last quarter of 1951, $205 in the first quarter of 1952, $200 in the second, and $189 in the third. A large purchase late in the year reduced substantially the metal available for sale and caused a reversal in the price trend; the quotation was $212-$214 on Dec. 10.

Mercury
Flasks of 76 lb.

	1951	1952
Production	7,293	Est. 12,400
Imports (general) (10 months)	34,470	61,000
Exports (10 months)	197	361
Average price, New York	$210.13	$199.097

Bismuth
in pounds

	1951	1952 Estimated
Consumption	1,750,000	1,800,000
Imports	514,000	665,000
Exports	146,998	280,000
Average New York price per pound in ton lots	$2.25	$2.25

Bismuth

ABBOTT RENICK
Commodity Specialist
Bureau of Mines

THE UNITED STATES is about 50% self-sufficient in bismuth, used chiefly in low-melting bismuth-base alloys and pharmaceuticals. Virtually all refined bismuth made in the United States is a by-product in refining domestic and imported lead and copper ores and imported lead bullion. Production in 1952 remained at about the same level as in 1951.

Nine months' data indicated that imports of bismuth metal, excluding bismuth contained in lead bullion from Mexico, would be higher than in 1951. Of 503,000 lb. imported through September, 97% came from Peru. Stocks of metal in the United States on Sept. 30 were about 42% below stocks on hand at the beginning of 1952. Demand for bismuth increased during the nine months continuing the uptrend that began in 1950. Incomplete consumption figures for 1952 indicate that metal products consumed 77% and the pharmaceutical industry 23%.

The New York market price for metallic bismuth remained unchanged at $2.25 per lb. in ton lots.

Ferroalloy Metals

Production exceeds requirements of consumption, also permitting additions to national stockpile, thanks to government incentives such as long-term purchase contracts. Steel strike cuts use.

NORWOOD B. MELCHER, Chief
Ferrous Metals and Alloys Branch Bureau of Mines

GOVERNMENT PROGRAMS designed to increase production of defense metals have been successful with the critical ferroalloy group of metals. With the aid of incentives such as long-term purchase contracts, the mining industry here and abroad has succeeded in stepping production up to a rate that exceeds consumption and allows significant additions to the national stockpile. Chromite, cobalt, manganese, molybdenum, and tungsten have now reached the point where anticipated supplies exceed expected consumption: this contrasts with the tight supply situation of a year ago. However, the supply still falls short of that needed to build up stocks at desired rates. Nickel is an exception to the improved situation, being still in critical short supply.

The steel industry, which consumes most of the ferroalloy metals, was handicapped by strikes during 1952 and consumption data should be interpreted with this in mind. During the first 10 months steel production averaged only 81.8% of capacity. The accompanying table compares AISI data for steel production or shipments with Bureau of Mines statistics regarding consumption of ferroalloy metals. This tabulation indicates that, in general, consumption of ferroalloy metals per ton of steel increased during the year.

The International Materials Conference, established in 1951 to foster equitable distribution of world supplies of critical items, published 1952 allotments of cobalt, molybdenum, nickel and tungsten that had been accepted by the governments of all member nations. In December the Conference announced agreement to discontinue international distribution plans for cobalt and tungsten, effective Dec. 31; however, provision was made for first quarter 1953 allotments of molybdenum and nickel.

At the year's end, many domestic producers were receiving prices of chromite, manganese and tungsten that were well above the world market. Excepting these government-supported premium prices, designed to stimulate domestic production, there was no marked change in prices during the year except the decline of world prices for tungsten concentrates. Manganese and chromite were slightly higher than in 1951.

General consumption patterns were similar to those of 1951. Jet-engine alloys required substantial quantities of several metals normally used in alloy steels, and are expected to take increasing quantities in future years. Capacity to produce ferroalloys was increased during the year.

Cobalt

HUBERT W. DAVIS
Commodity Specialist
Bureau of Mines

RECORD CONSUMPTION and imports, much greater use of scrap, continued allocation, and initial production of cobalt in December at the refinery of Calera Mining Co., in Utah, featured the cobalt industry in 1952.

During the first 10 months production of cobalt rondelles and granules in the United States was 1,335,000 lb., 2% under the corresponding period of 1951; and imports were about 9,258,000 lb., a gain of 31%. Belgian Congo and Belgium supplied 8,923,000 lb. of rondelles and granules and Canada 335,000 lb. Sales of cobalt metal to industry were up 12%. Production and imports of oxide (gross weight) were 667,700 and 351,750 lb., respectively, a gain of 8% in production but a loss of 4% in imports. Belgium supplied 350,200 lb. of oxide. Oxide sales were down 2%.

Consumption by industrial users was 8,586,000 lb. in the first 10 months, compared with 8,299,000 in the corresponding period of 1951. Taking 60% of the 1952 total, cobalt-chromium-tungsten-molybdenum alloys represented the largest single use for cobalt, and the quantity used was 29% greater than in 1951. Magnet alloys took 15%, but such use was 28% less. More cobalt was used in cemented carbides; less for alloy hard-facing rods, high-speed steels, ground-coat frit, and pigments.

Bethlehem Steel Co. and Calera Mining Co. were the only producers of cobalt concentrates from domestic ore. During the first 10 months, production (cobalt content) was 1,093,000 lb. compared with 754,000 in the corresponding period of 1951.

New Refinery Running

Calera's refinery at Garfield, Utah, was completed in July, but production did not begin until December, 1952. Commercial production was to begin January, 1953. Tune-up at the refinery progressed to a point which largely proved the feasibility at the Chemico acid-leach process. The metal will be marketed as rondelles, which, initially at least, will contain 95 parts cobalt and 5 parts nickel. Planned production is 1,650 tons annually. Construction of the cobalt-nickel-copper separation plant of Cobalt-Nickel Reduction Co. (subsidiary of National Lead Co.) at Fredericktown, Mo., was begun early in 1952; completion is scheduled for late 1953. Annual planned production is 700 tons of cobalt, 900 tons of nickel, and 700 tons of copper.

Production of electrolytic cobalt by Falconbridge Nickel Mines, Ltd., was begun at Kristiansand, Norway, in 1952. Union Miniere du Haut-Katanga, Belgian Congo, put a second three-phase furnace of 2,160 kva into service in August and was enlarging its Jadotville cobalt refinery. It was reported that Quebec. Metallurgical Industries, Ltd., a subsidiary of Ventures, Ltd., and Frobisher, Ltd., had completed negotiations for a smelter to produce cobalt, nickel, and silver at Cobalt, Ont. The refinery at NKana,

Percentage of Change, 1951 to 1952

FIRST TEN MONTHS IN EACH CASE

Ferroalloy Metals Consumption (Preliminary data)		Steel Production or shipments	
Chromite	— 4%	Total steel [1]	— 15%
Cobalt	+ 3%	Alloy steel [1 3]	— 11%
Manganese ore (35% or more Mn)	— 12%	High speed and tool steel [2]	— 30%
Molybdenum	— 4%		
Nickel	+ 16%		
Tungsten	— 23%		

[1] Production
[2] Shipments
[3] Other than stainless and heat-resisting ingots

Northern Rhodesia, of Rhokana Corp., began producing metal in 1952. Construction work was started in May on the refinery of Sherritt Gordon Mines, Ltd., at Fort Saskatchewan, Alta.; completion is scheduled for Dec., 1953. Annual production planned from concentrates from company mines at Lynn Lake, Man., is 150 tons cobalt, 8,500 tons nickel, and 4,000 tons copper.

Cobalt in white alloy (crude) imported from Belgian Congo during the first 10 months was 2,473,379 lb., a gain of 30% over the corresponding period of 1951. Receipts of ore from Mexico and French Morocco were 17,284 and 100 lb., respectively.

During the 10 months, consumption of cobalt contained in white alloy and ore by refiners and processors was 2,493,821 lb., again of 5%, but use of cobalt intermediates by refiners and processors was 669,385 lb., down 7%.

Exports reported during the nine months were 1,554,224 lb. (gross weight) of metal (chiefly scrap and alloy) and concentrates. The bulk of the reported exports was cobalt concentrates shipped to Belgium for refining on toll for the U. S. Government.

Prices of metal and oxide remained unchanged throughout 1952. Metal (97-99%) in 500-600 lb. kegs was quoted at $2.40 a pound f.o.b. Niagara Falls or New York, and ceramic-grade oxide (72½-73½%) at $1.82 a pound (gross weight) east of the Mississippi River.

Free-World production of cobalt in 1952 will probably be substantially greater than in 1951, when about 8,500 metric tons was produced. Production in Belgian Congo, the largest producing country, will, it is estimated, reach 6,500 to 7,000 metric tons, compared with 5,875 tons in 1951.

Allocation of cobalt by the International Materials Conference to Free-World countries was continued. During 1952 the United States was allocated 6,334 metric tons, or 65% of the total. On Nov. 28 the IMC announced that an improvement in the supply position made it unnecessary to recommend the adoption of distribution plans for cobalt for the first quarter of 1953.

Tungsten

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Assistant Chief
Ferrous Metals and Alloys Branch

PRODUCTION OF TUNGSTEN concentrates here and abroad responded to high demand: Preliminary estimates indicate that domestic production was up 15%. Plant expansion was in progress at several domestic mines during 1952 and a considerable increase in production is expected in 1953 from deposits where new mills were completed late in 1952. California, Nevada, North Carolina, Colorado, and Idaho were the principal sources.

In March, the United States Vanadium Co.'s Pine Creek mill and digestion plant in California was damaged by a snowslide. However, there was no great loss of production.

Developments at other major producing tungsten mines include construction of mill units at the mines of Tungsten Mining Corp., North Carolina, Black Rock Mining Co., California and Nevada, and Climax Molybdenum Co., Colorado. Extensive development programs were completed or in progress at the same mines and at the Getchell Mine, Inc., Nevada; Bradley Mining Co., Ima mine, Idaho; Nevada Scheelite, Nevada; and Nevada Massachusetts Co., Nevada. Improved milling methods have increased recovery and grade of concentrates produced at Getchell, and are expected to increase recovery at Tungsten Mining Co. The Bradley Mining Co.'s Yellow Pine mine at Stibnite, Idaho, discontinued operations in June because of lack of demand for antimony. During World War II this mine was the leading producer of tungsten, and in 1951 over 9,000 units was produced as a by-product of antimony mining and from tailings and placer operations. However, exploration and metallurgical research are being continued and tungsten production from the nearby Springfield deposit is expected in 1953. U. S. Vanadium Co.'s Riley mine, Nevada, also an important World War II producer, resumed production; the ore is treated at the Getchell mill. During 1952 there were many reports of activity at deposits that were not productive in 1951.

A substantial increase in production from areas outside the United States led to a corresponding increase in imports and to a general easing of the supply situation in other consuming nations. On Dec. 19 the IMC announced that international allotments for tungsten were to be discontinued, effective Dec. 31.

Quotation Unchanged Here

E&MJ market quotations for domestic tungsten concentrates remained unchanged at $65 per short ton unit for the entire year. However, substantial quantities were sold to the government under the terms of the DMPA-GSA purchase plan that provides a basic price of $63. Quotations of London prices indicated a drop from 485 s. per long ton unit ($61 per short ton unit) in January to 410 s. ($51 per short ton unit) for wolframite and 400 s. ($50 per short ton unit) for scheelite in December.

General imports (receipts) of tungsten ores and concentrates into the United States were 11,746,136 lb. during the first nine months of 1952 (7,534,048 lb. during the entire year 1951). These quantities represent ores and concentrates received in the United States, irrespective of final disposition; about 20% of total imports entered

Tungsten Ore and Concentrates, Salient Statistics

(Thousands of pounds metal content)

United States	1951	1952
Production	5,914	6,790 *a*
Consumption	11,410	6,588 *b*
General imports	7,534	11,746 *b*
Exports	———	———
Industry stocks, end of period	4,272	1,909 *c*

a Estimate for entire year. *b* First nine months. *c* September 30, 1952.

bonded warehouses. Republic of Korea (2,602,802 lb.), Bolivia (2,066,538 lb.), Portugal (1,809,762 lb.), Spain (1,195,019 lb.), Thailand (925,850 lb.), Burma (754,633 lb.), and Brazil (710,291 lb.) supplied 86% of the total for the first nine months.

Imports of ore and concentrates for consumption were 12,090,986 lb. during the first nine months of 1952 (6,376,513 lb. during the entire year 1951). These represent ores and concentrates on which the duty have been paid and concentrates received duty-free for United States Government account. All the above import data refer to pounds of metal content.

Consumption of tungsten concentrates in the United States during the first nine months of 1952 was 6,923 short ons (60% WO_3 basis), compared with 9,435 short tons in the corresponding period of 1951. Consuming firms were able to secure scheelite concentrates of satisfactory grade during the entire year; however, firms using high-purity wolframite concentrates often found it difficult to obtain lots that would meet their specifications.

Nickel

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Commodity Specialist
Bureau of Mines

THERE WAS A CRITICAL SCARCITY of nickel for industry requirements in 1952, and allocation to the Free-World countries continued.

Output of nickel in Canada during the first 10 months was 118,461 short tons compared with 114,619 tons in the like period of 1951. Exports during these periods were 118,398 and 105,664 tons. Output of nickel oxide in Cuba in 1952 was about 8,500 short tons (nickel content).

Nickel consumption in the United States was about 82,000 short tons during the first 10 months and is estimated at 100,000 tons for the year, or 16% more than in 1951. Quantitywise, the gains were most pronounced for stainless steels, nonferrous metals, and anodes. Use of nickel for engineering steels and cast irons was about the same as in 1951. Consumption in magnets and ceramics declined.

Imports in the first nine months of 1952 (figures for the full year 1951 are shown in parentheses) comprised 58,985 (76,680) short tons of metal, 15,770 (11,986) tons of oxide and oxide sinter, and 11,048 (12,829) tons of matte. The nickel content of these products is estimated at 78,600 tons during the first nine months (93,100). Canada was the chief source. Imports of oxide from Cuba were 4,183 tons (gross weight) in the first nine months.

Exports consist largely of products made from imported raw materials. During the first nine months (figures for full year 1951 in parentheses) they comprised 4,045 (3,992) tons of alloy and scrap, 351 (193) tons of metal in ingots, bars, sheets, etc., and 68 (197) tons of nickel-chrome electric resistance wire.

Seek Nickel in Minnesota

During 1952 International Nickel Co. of Canada undertook prospecting for copper-nickel ores in northern Minnesota.

Falconbridge Nickel Mines' refinery at Kristiansand, Norway, was changed over to the chloride process in March with a minimum disturbance to production. Drilling at Falco's Fecunis Lake property in Canada has indicated a reserve of 10-million tons of ore containing more than 2.74% nickel.

Rehabilitation of the nickel-producing facilities at Nicaro, Cuba, was completed in 1952. The last two of the 12 furnaces went into operation July 7.

Negotiations were completed between DMPA and Hanna Development Co. to install three electric furnaces to produce ferronickel from the silicate ore of Riddle, Ore. Production will probably be at an annual rate of 6,900 short tons, beginning in 1954.

Salient Statistics for Nickel

1951-1952 Short Tons

	1951	1952 (Est.)
United States:		
Imports	93,100	108,000
Consumption	86,416	100,000
Canada:		
Production	137,268	142,000
Exports	130,239	142,000
Cuba:		
Production	———	8,500
Price per lb.[1]	50½-56½¢	56½¢

[1] Electrolytic nickel in carlots of f.o.b., Port Colborne, Ont., including duty of 1¼¢.

Construction of the refinery of Cobalt-Nickel Reduction Co. (subsidiary of National Lead Co.) at Fredericktown, Mo., was begun early in 1952; completion is scheduled for late 1953. Annual production planned is 900 tons of nickel, 700 tons of copper, and 700 tons of cobalt.

Construction was started in May on the refinery of Sherritt Gordon Mines, Ltd., at Fort Saskatchewan, Alta.; completion is scheduled for Dec., 1953. Annual production planned is 8,500 tons of nickel, 4,000 tons of copper, and 150 tons of cobalt.

Two nickel discoveries were reported made in Yukon Territory in 1952. The Hudson M. & S. Co. took an option to purchase 190 claims. The most important showing is 48 ft. wide and assays plus-3% nickel, 2.78% copper, about 0.5% cobalt, and about 0.1 oz. platinum. Other strong exposures of nickel-copper have been found.

Permits have been granted by the Bureau of Land Management to prospect for nickel-copper ore in the Superior National Forest, Lake County, Minn. Exploration has indicated the possibility of enormous reserves of low-grade nickel-copper ores along the western contact of the Duluth gabbro.

Throughout 1952 the contract price to United States buyers for electrolytic nickel in carlots f.o.b., Port Colborne, Ont., was 56½¢ a pound, including duty of 1¼¢. For nickel oxide sinter (no duty), the price was 53¾¢ a pound (nickel content) f.o.b. Copper Cliff, Ont. These prices have been in effect since June 1, 1951.

Allocation of primary nickel to the Free-World countries by the IMC was continued. During 1952 the U. S. was allocated 96,340 metric tons, or 67.6% of the total.

Chromite

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	SHORT TONS
Domestic production	**20,000**
Domestic consumption	**1,192,800**
Imports, estimated	**1,580,000**
Exports	**none**

BECAUSE OF THE STEEL STRIKE, consumption of chromite during nine months of 1952 was 4% below 1951 (869,790 short tons). Compared with 1951, and based on nine months, metallurgical use increased 19%, while the refractory and chemical decreased 16% and 43%, respectively. Consumption is estimated at about 1,192,800 tons for 1952, compared with 1,212,480 tons for 1951.

United States imports for nine months totaled 1,162,905 short tons —1% higher than in the same period of 1951; the total for 1951 was 1,429,020 tons. Of the 1,162,905 short tons received in the first nine months, 674,016 was metallurgical, 340,418 refractory, and 148,471 chemical grade. Turkey was the chief supplier (all shipments were metallurgical ore), 29% of the total; the Philippines supplied 26%, mostly refractory; South Africa, 20%, mainly chemical ore, the only supplier of this grade. Southern Rhodesia supplied 12%, mostly metallurgical; Cuba, 6% (metallurgical refractory); New Caledonia, 3% (metallurgical); British West Africa, 2% (metallurgical); and 2% (metallurgical ore) was supplied by Afghanistan, Guatemala, India, Pakistan, and Yugoslavia. Total imports of chromite for 1952 are estimated at 1,580,000 short tons.

Domestic production of chromite was accelerated in the last half of 1951 and 1952 due to the opening of the purchase depot at Grants Pass, Ore., by the GSA. Total production in 1951 was 7,056 short tons. California accounted for 89%, and Oregon 11%. The preliminary figure for 1952 is 20,000 short tons.

On April 28, 1952, DMPA announced the signing of a contract to bring into production the United States' largest reserves of chromite, located in Stillwater County, Mont. Production by American Chrome Co. is expected within a year, and 900,000 short tons of chrome concentrates of at least 38% Cr_2O_3 is to be supplied during the following eight years. The government has agreed to pay approximately $35 per long ton for the 38% Cr_2O_3 concentrate.

Consumers' stocks totaled 776,405 short tons on Sept. 30, 1952. Stocks at the end of 1951 were 637,453 short tons.

Chromite prices increased slightly for some grades as indicated by the following prices, f.o.b. cars, eastern seaboard: Indian and Rhodesian, 48% Cr_2O_3, 3:1 ratio, $43-$45 (Jan. 1) to $44-$46 (Nov. 27); South African, 48%, no ratio, $34-$35 (Nov. 27), no increase. Turkish 48%, 3:1 ratio, $53-$54 (Jan. 1) to $55-$56 (Nov. 27). For domestic chromite, delivered to Grants Pass, Ore., the General Services Administration offers $115 for lump ore and $110 for fines and concentrates containing 48% Cr_2O_3 and having a Cr/Fe ratio 3:1.

Statistics on Molybdenum for U. S.

(Thousands of pounds, metal content)

Molybdenum Concentrates	1951	1952 [1]
Production	38,855	32,201
Consumption	33,691	24,241
Exports [2]	3,729	4,180

[1] First nine months. [2] Includes roasted concentrates; these also appear in "Consumption."

Molybdenum

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PRODUCTION OF MOLBYDENUM concentrates was up 13% and consumption was down 3%, according to estimates. However, demand for molybdenum products for consumption, export, and the national stockpile continued to exceed supply, and domestic control of shipments and use and international allotments were retained. Much of the increased production resulted from mine and plant expansion at Climax, Colo. Still higher production was about 87% of that of the total free world during the year. The only other nation producing a significant quantity of molybdenum was Chile.

The IMC Tungsten-Molybdenum Committee announced agreements for international distribution of those metals for each quarter of 1952 and for the first quarter of 1953. In 1952 the United States was allotted 73.4% of the total, and for the first quarter of 1953 this was increased to 75.4%.

Exports of molybdenum contained in concentrates and molybdic oxide were 1,443,700, 1,297,800, and 1,438,300 lb. in the first, second, and third quarters of 1952. This compares with 890,000, 201,000 and 1,407,000 respectively in the same period of 1951.

Domestic production of concentrates was 32,200,900 lb. (contained molybdenum) in nine months. Producing states were Arizona, California, Colorado, Nevada, New Mexico, and Utah. Colorado made the largest increase in production. Shipments of concentrates from mills in the first nine months comprised 27,077,100 lb. to domestic users and 3,750,200 lb. for export.

Consumption of concentrates was 24,241,000 lb. (contained Mo) in the first nine months, a 3% decrease compared with the same period in 1951. Stocks of concentrates held by industry increased from 5,970,000 lb. (Mo) on Sept. 30, 1951, to 7,263,000 on the same date in 1952.

Production and shipments of molybdenum products totaled 23,913,000 and 21,741,000 lb. (contained Mo) in the first nine months, decreases of 2 and 6% respectively. Stocks of products held by producers were 5,209,000 lb. (contained Mo) on Sept. 30, 1952, compared with 2,880,000 on the same date, 1951.

The quoted price of concentrates containing a minimum of 90% MoS_2 has remained unchanged at 60¢ a pound of MoS_2 since Dec., 1950; the previous level was 54¢.

Manganese

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DOMESTIC PRODUCTION of ore containing 35% or more manganese was approximately 110,000 short

(Continued on page 123)

BY-PRODUCT SLAG coming from electric furnace making elemental phosphorus is rendered highly porous by action of water and steam to yield lightweight concrete aggregate. The method is not yet on a production basis.

Nonmetallics

Phosphate

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ACTIVITIES in the western phosphate field continue to center around electric furnaces for making elemental phosphorus. In this development the Westvaco Chemical Division of Food Machinery and Chemical Corp. leads. During 1952 they finished building their fourth furnace and are now using 500,000 tons of phosphate shale supplied under a long-term contract by Simplot Fertilizer Co. Victor Chemical Co. completed its first electric furnace at its western plant, at Silver Bow, Mont. and has announced it will build another furnace.

Monsanto Chemical Co. is also getting into electric furnace production of elemental phosphorus in the western field at its Soda Springs operation in Idaho. This 25,000-kw. furnace was built by Morrison-Knudsen Co., Boise, Idaho. The plant will take over 200,000 tons of phosphate shale annually. Stripping was started late in 1951 and open-cut mining in 1952, the rock being stockpiled at the Soda plant site. Victor Chemical gets its rock from an underground operation, Monsanto and Westvaco are supplied from surface mines.

Simplot continued mining at Gay, Idaho, stepping up the rate last year. An improved car-loading system incorporating an automatic triple-sampling device was installed. This, with other changes, will increase loading capacity to 8,000 tons per day. Simplot estimates an output in 1953 of 700,000 tons of shale and rock, the shale going direct to the Westvaco plant site, where it is stockpiled, and the high-grade rock to the Simplot superphosphate plant at Don, Idaho. Mine production in 1952 approximated 550,000 tons.

San Francisco Chemical Co. stepped up production at its Hillside strip mine, east of Montpelier, where it has a crushing plant. It also operates a mine at Leaf, Wyo. Anaconda Mining and Smelting Co. installed a washing plant at its Conda, Idaho property to upgrade the P_2O_5 content. The Conda product still comes from underground mining, but the company is planning a surface operation.

Rumors about exploration and survey of deposits in Utah, Wyoming, and Idaho, and various proposals for new projects in the western field were heard in 1952, but for the first time hedging was apparent. Competition from phosphate elsewhere in the U. S., as well as a softening in the market for elemental phosphorus, made interests more cautious about entering the western field.

Western Fertilizer Co., backed by groups of farm co-operatives in the Northwest, started development of its deposits at Dry Ridge, near Georgetown, Idaho. A plant site adjoining Monsanto's at Soda Springs has also been taken, but there are no immediate plans for construction. The possible mining of phosphate in the Kemmerer, Wyo. area and in Utah was also mentioned, but no actual processing appears to have been done.

No exports were made in 1952 from the Idaho and Wyoming mines. However, the Garrison, Mont. mine of Montana Phosphate Products continued to ship to the Consolidated M&S Co.'s plant at Trail, B. C., where a natural gas supply has made ammonium phosphate the logical product.

Simplot launched a plant conversion from single to triple superphosphate production. This project was nearly completed by the end of 1952. The plant will start late in

March, 1953. Its initial capacity will be 50,000 tons of concentrated superphosphate.

In the Tennessee Field

Mining in the field of central Tennessee followed established patterns and tonnage mined remained about the same. The increased rate at which phosphate areas within a few miles of processing plants have been mined has forced some companies to supplement these tonnages with others from greater distances which are delivered by rail. Gasoline and diesel truck units ranging up to 12-cu.yd. pay-load capacity are used for the relatively short haul to rail shipping point. Commercial rail facilities are employed for rest of distance.

Monsanto is currently building rail shipping facilities near Franklin, Tenn. thus permitting the economic delivery of phosphate matrix to its plant about 20 miles away. Matrix mined by Virginia-Carolina Chemical Corp. at Wales is also delivered by rail to its Mt. Pleasant plant 26 mi. distant.

Shea Chemical Co. shipped its first di-calcium phosphate produced at newly built facilities near Columbia in Oct., 1952. This company's electric furnace for making phosphorus was to be in operation early in 1953.

TVA's Major Developments[1]

Tennessee Valley Authority has discontinued washing phosphate in the Tennessee field and will blend phosphate matrix with Florida phosphate to make charge for its electric furnaces at Wilson Dam. Installation of equipment for blending and drying the matrix and Florida rock is nearing completion there. Incorporation of unwashed matrix in the furnace charge is expected to bring about substantial savings. More important, the plan will result in conservation of Tennessee reserves, as none of the phosphate will be lost in washing.

Operation of the phosphate pelletizing and calcining unit for making the electric furnace feed continued. The process consists of mulling phosphate sand or pebble with matrix in a wet pan, tumbling in a rotating cylinder to make pellets, and calcining in a vertical shaft kiln. Mechanical difficulties have hampered mulling and calcining. Changes were made in the equipment and the unit is now making satisfactory pellets at an improved rate although capacity is still lower than expected.

Another year of experimental operation of TVA's rotating phosphorus furnace has demonstrated conclusively its several advantages over the stationary furnace. Power savings as compared with power costs of the stationary electric furnaces at Wilson Dam were shown consistently. Inspection of the furnace lining after two years' operation showed much less wear than would be expected in a stationary furnace with the high loads used. Phosphorus producers have shown much interest in the development, and at least one company has built a rotating furnace.

A method has been developed for making lightweight concrete aggregate from the slag produced in making elemental phosphorus. The slag coming molten from the electric furnace is subjected to action of water and steam, which make it highly porous. Although the method is not yet on a production basis, tests have been made in large-scale equipment and quantities of the expanded slag produced for experimental manufacture of concrete blocks.

TVA also will build a plant for demonstrating several nitric phosphate fertilizer processes. Plans for such a plant were shelved two years ago because of pressure of defense work. Pilot-plant development was continued, however, and additional variations in the procedure were worked out.

TVA and the Department of Agriculture are completing a project aimed at helping superphosphate producers fit their manufacturing processes into the program of the Atomic Energy Commission. The AEC plans diversion of some sulphuric acid from the manufacture of ordinary superphosphate to the production of phosphoric acid, which, after treatment for recovery of uranium, will be released to fertilizer manufacturers for making superphosphate. Technical information on the use of the phosphoric acid, either alone or mixed with sulphuric acid, in standard commercial equipment will be needed by the fertilizer companies. A pilot plant was built and the work planned was completed. Conditions were determined for producing superphosphates containing 28, 33, and 45% available P_2O_5 in ordinary superphosphate mixing and equipment. A report is being prepared for publication.

Studies also were made of methods that may permit superphosphate manufacturers to replace part of the sulphuric or phosphoric acid that is normally used with nitric acid without making any major plant changes.

Other pilot-plant activities included experimental studies of continuous ammoniation of superphosphate, manufacture of wet-process phosphoric acid from low-grade phosphate ore, and production of diammonium phosphate from wet-process phosphoric acid.

Activities in Florida Field

Of the three types of phosphate mined in Florida, two, hard rock and soft rock or colloidal phosphate, with an annual output of less than 100,000 tons each, are insignificant compared with the 8-million-plus tons that are produced annually by the Florida land pebble phosphate mines. In the latter there are seven mining companies whose major activities were as follows:

American Agricultural Chemical Co. installed a new belt recovery plant at their standard grade washer at Pierce, Fla. By processing washer tailings through a hydrosizer a suitable feed for concentration is produced. This then goes through a Minerals Separation belt concentrator.

This company also started production of a new electric phosphorus furnace at Pierce. It has an annual production capacity of approximately 4,000 tons of elemental phosphorus.

American Cyanamid Co. had no significant changes or additions to report.

Coronet Phosphate Co. during the year placed in operation the wet storage, drying and shipping facilities at their new Tenoroc mine. Ownership of Coronet was acquired by the Smith-Douglas Co., of Norfolk, Va.

Davison Chemical Corp.'s phosphate rock division reports the following for 1952:

1. A Bucyrus-Erie Model 650-B dragline was erected and placed in operation at Bonny Lake mine. This machine is the first equipment in this division to operate from a 4160-v. resistor grounded neutral system which incorporates the latest personnel and equipment protection features. Davison now has three mining draglines.

2. Construction of a triple-superphosphate plant at Ridgewood was begun in July, to be completed late in 1953. The Dorr process will be used.

[1] Dr. J. H. Walthall, director, Division of Chemical Development, Tennessee Valley Authority.

Consumption of Phosphate Rock, 1951, Broken Down by Uses

Product	Florida Tons	Florida %	Tennessee Tons	Tennessee %	Western Tons	Western %	Total Tons	Total %
Superphosphate	5,493	77.8	323	22.7	295	31.6	6,111	64.9
Phosphorus, Phosphoric acid, etc.	739	10.5	867	61.1	563	60.4	2,170	23.0
Direct application rock	711	10.0	211	14.9	72	7.7	994	10.6
Feed supplement, Filler, etc.	121	1.7	19	1.3	3	0.3	143	1.5
	7,064	100.0	1,420	100.0	934	100.0	9,418	100.0
Plus imports from Curacao used in feeds							90	
							9,508	

The apparent phosphate consumption in U. S. was 9,508,000 tons in 1951 as against 8,581,000 tons in 1950. Broken down by "uses" the 1951 consumption presents the picture given in the table. This distribution shows the trend toward increased output of phosphorus, phosphoric acid, and direct application rock with a corresponding decrease in the manufacture of single superphosphate.

The average value at the mines was $5.96 per ton in 1951 as against $5.76 in 1950.

Domestic Production Up

No statistics for the U. S. industry are as yet available for 1952. It is estimated, however, that production in the three mining areas will have approximately: 8,700,000 tons in Florida, 1,500,000 tons in Tennessee; and 1,200,000 tons in Western States. Total estimated, 11,500,000 tons; against 10,775,000 long tons in 1951.

U. S. consumption plus exports are estimated at 11.7 million tons, hence a further reduction in stocks will have taken place, particularly in the Florida field. Since for the next few years continued increases in consumption is expected, additional mining facilities are under consideration by the mining companies.

Foreign Shipments Off

World shipments in 1952, with the exception of U.S.A., fell off and it is doubtful whether 23-million tons was moved. (World shipments in 1951 reached a new record high with 24.2-million tons as against 22-million tons in 1950). The reason was an overstocked position in the face of reduced fertilizer sales in many countries. After this situation has cleared up, drastically reduced ocean freight rates and more plentiful sulphur supplies should give impetus to a high level of shipments in 1953, when the 25-million ton mark should be exceeded.

New miners have entered the world picture: Trial shipments have already been made from new mining operations in Transjordan and Israel. In French Senegal, deposits of alumina and calcium phosphate are under investigation and trial shipments have been made to Europe through the port of Dakar. Finally, it appears that deposits in Brazil will soon be exploited on a larger scale than they have been hitherto.

3. Construction of a pipe line has been started through which recovery plant tailings (sand) will be pumped into mined-out cuts and lowland areas adjacent to the city limits of Lakeland. This is the initial phase of a project to convert this former waste and swamp area into a residential subdivision.

4. A rubber-lined slurry pump has been built by Davison and placed in operation in July. Results have been satisfactory. Further uses for rubber lining to reduce abrasive wear are being investigated.

5. A Moretrench Wellpoint system was used successfully to predrain areas adjacent to the mine cuts at Davison's Bonny Lake mine. This system effectively reduced the frequency of bank slides into the mine caused by subsurface water seepage.

New Mine for International

International Minerals & Chemical Corp. added a new classifier to the Noralyn plant to increase feed supply. An addition to Noralyn's spiral section is being installed. Certificates of necessity have been obtained for a new dragline and for a new mine which is expected to be in operation in 1954. A large phosphate products plant is under construction which will start the manufacture of multiple super and of a phosphorus feed supplement during the first half of 1953. During 1952 a new central research laboratory was completed at Skokie near Chicago.

This company has developed a new and revolutionary beneficiation process applicable to phosphate and potash as well as to many other types of ores. The process is a dry beneficiation method, using neither reagents nor water. The ore is ground, dried, given a simple and inexpensive treatment, passed between electrodes, and separated into various minerals. Further tests are being made in a large-scale pilot plant.

Swift and Co. report the following developments at their Agricola mine.

1. A new office building and control laboratory are now in use.

2. An addition to the phosphoric acid unit is under way, to be completed in June, 1953. It includes a 100-ton Leonard-Monsanto contact acid plant.

3. An increase in grinding capacity by 20% is contemplated through revamping the air system and mill drive of the existing 73-in. Raymond roller mills.

Virginia-Carolina Chemical Corp. have successfully adapted for matrix pumping high efficiency pumps which heretofore had only been used for pumping sand. Improvements on a 5-mi. pipe line resulted in much better performance than originally estimated.

Disintegrators for handling mudballs on the washers have been developed and are now working satisfactorily at both washers at low maintenance and operating cost.

Work is under way on new wet storage, drying, and grinding facilities at the Nichols mine, incorporating the most modern and most efficient equipment, as for instance a double-wing stacker and parallel reclaimer tunnels. The design provides for large capacities and low-cost handling and processing.

Construction is also under way on V-C's new triple superphosphate plant at Nichols which will have a uranium recovery unit attached. It will have other new but as yet classified features.

Potash

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PRODUCTION OF POTASH in 1952 in the United States exceeded that of any previous year. The output is estimated as equivalent to 1,580,000 short tons of K_2O. Of this the Permian Basin area in New Mexico, which includes the Carlsbad region, supplied 1,513,000 tons. United States consumption is estimated at 1,780,000 tons. By 1955 production is expected to equal consumption in this country. About 94% of the U. S. output enters the fertilizer industry.

Duval Under Way

In December, 1951, Duval Sulphur & Potash Co.'s plant was nearing completion, and trial runs were being made on development ore. A few cars of finished product had been shipped. By March 9, the entries between the two shafts were completed, the ore being used for continued testing. Some equipment was lowered in this period. On March 9 the first ore was hoisted in skips through the main ore hoisting shaft. Scheduled production of 2,400 tons per day of crude ore was reached May 1, and the rest of the mining equipment was lowered. New equipment at Duval consists of a jumbo drill, a belt conveyor for haulage in one section, a diesel-electric shuttle car, and a diesel-powered Willys jeep for moving men and supplies. The rest of the mining operations follow what is the conventional pattern in the field, using electric power until belt haulage and diesel power can be thoroughly tested.

At Duval's refinery, process brine was prepared in Nov., 1951, from development ore and in Dec., 1951, 1,500 tons of 60% muriate of potash was produced from additional development ore. Present production is up over that of previous months and the refinery is reported to be giving excellent extraction results at milling rates approaching 3,000 tons per day.

At the end of 1951, Southwest Potash Corp. was sinking two circular shafts, 15 and 20 ft. in diameter, and building a refinery. This construction program was completed late in September. Skip hoisting was started at Shaft No. 1, and the first muriate of potash shipped in October. Southwest is the fifth producer in the Carlsbad region, and the seventh major potash producer in the United States. The refinery went on a continuous basis in November.

New men were hired as room was gained underground for additional mining crews. By the end of 1952, 2,500 tons per day was being refined. Production of crude was expected to pass 3,000 tons per day by Jan. 31, 1953.

United States Potash Co. moved all office operations to its new building in Carlsbad the past fall. Additional industrial mobile radio-telephone equipment was installed on company cars.

At the mine a station was cut at the fifth level of No. 3 shaft and development of No. 2 ore bed begun. Ventilation doors and air-locks were installed near the sixth level station, No. 2 shaft.

Sinking of the 15-ft. circular concrete-lined No. 3 shaft continued. This was 516 ft. deep by the year end. The immediate shaft area was pregrouted through the water zones. A new 90-ft. headframe and a used two-drum Wellman-Seaver-Morgan hoist were provided, also rail facilities to serve the new shaft site.

A second-hand 150,000-cfm Jeffrey Aerodyne fan was installed in the return airway of the double-entry haulageway being carried from the present working to the new No. 3 shaft. This is being used as a booster to carry air through the haulageways in which diesel equipment is being used.

A Continuous Miner

A second 4D Caterpillar diesel bulldozer was put on backfilling, and two additional GMC-equipped 15-ton trailer trucks of company design and build went into service on development work. These travel up to speeds of 20 mph. Additional Joy loading equipment, as well as a Joy 4JCM Continuous Miner, were put into service.

Additional carrier-current Trolleyphone equipment was installed on underground locomotives to increase safety and speed up tramming.

The 12,470 v. power-distribution system installed in 1951 gave good service.

Drop-bottom cars of 42-in. gage were delivered during the year. Engineering work on a 42-in. gage underground diesel locomotive was completed, and an order placed with General Electric for one unit to be delivered early in 1953.

A diesel-powered airport-type tractor, equipped with a scrubber, for handling light trailers for men and equipment was provided underground, and an electric steam cleaner for removing grease and dirt from equipment in the underground repair shop.

Changes were made in the design of the company's granular plant to produce a 60% granular product, as well as the 50% material previously processed.

For Better Recovery

At the refinery additional equipment was installed to improve recovery and increase output. This includes three precoat filters for washing and debrining waste mud, and additional Bird centrifuges for handling of waste salt tailing. Filtering, washing and bagging equipment for making chemical-grade muriate was being installed. A new unit of dissolving equipment was also completed. Modern switch gear was installed in the company power plant replacing older oil-type circuit breakers.

A second GE 70-ton diesel-electric locomotive was put into service on the tramroad between mine and refinery. This unit is normally operated in tandem with the original locomotive, purchased some years ago. Two miles more of tramroad track was relaid with 110-lb. steel.

Potash Company of America completed its 765-ft., 15-ft. dia. south shaft in May, 1952. This was sunk by freezing in the upper 300 ft. because of quicksand in the water zone. On completion it was possible to increase the underground ventilation by 90,000 cfm. over past practice.

The company has put into service two additional Continuous Miners (3 JCM Joy) making a total of four in operation. These are low-height machines, cutting to a height of 79 in.

International Minerals & Chemical Corp. installed new ore-handling facilities underground to take care of the ore from the southwestern extension of the present workings. Included were a rotary car dumper, 60-in. apron feeder, 36 x 54-in. single-roll crusher, a 1,000-ton ore pocket with a 48-in. apron feeder, and a 30-in. belt conveyor, 812 ft. between centers on an 11¾-deg. slope. The new rotary car

dumper is air-operated and turns through 180 deg. It works twice as fast as the older type which turns through 360 deg.

New equipment for mining and maintenance was installed. In the underground shops, fork lifts are being used to handle oil barrels and other heavy equipment. Steam cleaners, operating from 220 v., have proved timesavers in cleaning parts for repair and painting.

Low-height shuttle cars and loaders are in operation. Two Continuous Miners were put in service recently and were used successfully to drive an undercast beneath a track haulage entry, and for general development. These are Joy Type 4 JCM, which cut to a height of 96 in.

A new method of driving ore passes by means of long-hole down drilling was successfully employed. This involved the use of one of the post-mounted electric drills with an air swivel for blowing out the cuttings. Drill steel used consisted of 2-ft. core-drill "E" rods. Advantages of long-hole down drilling of ore passes are: (1) Sheer walls, which should eliminate hang-ups. (2) Elimination of hand mucking.

The air swivel is also being tried out on the jumbo drills to remove drill cuttings.

More Power for Hoisting

The automatic hoist at International's No. 1 shaft will have its power supply increased about 50% to increase hoisting capacity. The control room to house the 1750-hp. synchronous motor-generator set and its associated control, will be pressurized, and water-washed air will be brought into it. The only discharge from the room will be by duct work into the end bells of the two 800-hp. dc motors driving the hoist. The main feature of this hoist expansion is the new remote-control hoist console, which will be located at the collar of No. 1 shaft instead of in the hoist house. Normally, the hoist will be operated fully automatic with a hoistman at the new station.

Construction of a new office building for the potash division, to be located at the mine site, will begin during 1953.

In spite of inter-union struggles and changes in representation in the Basin, labor-management relations have remained on a high plane, production has been increasing steadily, and a real spirit of cooperation appears to be dominant in the minds of all parties concerned.

Asbestos

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DISREGARDING the bad strike of 1949, the year 1952 witnessed the first reversal in the upward trend of Canadian asbestos production since 1944. However the decrease occurred in the output of Groups VI and VII fibers—the "waste" and "refuse" groups, or "shorts." This development was not a surprise, however, since this reviewer pointed out last February that all grades of asbestos were in acutely short supply except "shorts," which had been produced in such quantity during 1951 that users of these grades had acquired an inventory for the first time since 1949.

Although the output of crude appears to have declined slightly, it should be noted that producers are throwing more of the longest fibers into the milled grades to produce spinning fiber. The three main groups of so-called milled fibers (spinning, shingle, and paper stocks) showed increases.

Thus while shipments of shorts from Quebec (including those for use in Canada) dropped from 517,222 short tons to 459,800 for the 10-month period, a decrease of 11.1%; the milled fibers showed an increase from 254,705 tons to 264,280, or 3.8%. However the ratio of shorts to total production was still high—63.5% of the total. In September the yearly trend reversed, and production of all grades both in September and October exceeded that of 1951 by more than 10,000 tons. Assuming that this rate of increase held for the last two months of 1952, shipments for the year might total about 955,000 to 960,000 short tons.

An increase in the selling price of the first week in 1952, which averaged roughly 10% across the line, leads to an estimated $88-million as the value for Canadian production for 1952.

Disproportionately less tonnages were exported from Canada during the first ten months of 1952 as compared with the previous year. This indicates a greater use within Canada for its own fiber.

Estimated world production for 1951 was set at 1.3 to 1.4-million short tons by this reviewer last February. The U. S. Bureau of Mines in a release in June estimated the total as 1.4-million metric tons. Taking all factors into consideration, it is expected that the 1952 production figure will be about the same.

On Jan. 17, NPA issued order M-96 to assure supplies of chrysotile spinning fiber for defense-essential products. On Aug. 28 the U. S. Government announced that the Defense Materials Procurement administrator had decided to establish a modern processing plant in Arizona along with ancillary buying and disposal facilities to produce fiber for national stockpile. This was done to diminish U. S. dependence upon foreign sources for long-fiber, low-iron chrysotile asbestos.

Imports of asbestos in the U. S. according to the Bureau of Census, were 440,571 long tons valued at $40,653,205 for the first eight months of 1952. Exports for the same period were 6,746 long tons valued at $1,859,582. Accordingly it may be estimated that imports for 1952 will total about 625,000 long tons valued at about $63-million, and exports, 8,500 long tons valued at about $2.35-million.

Trends in Canada

Since Canada produces about two-thirds of the world's total output, the trend of developments there will be of chief interest. In 1951 Canada produced 991,766 tons of asbestos from 12,623,529 tons of rock mined of which 10,219,658 was milled. In 1950 tonnage mined was 12,210,780, of which 8,635,036 was milled. The greater percentage milled, in 1951, 80.9% vs. 70.7% in 1950, is probably due to three factors: (1) Considerably higher selling prices converted what was formerly protores into ore; (2) more mill feed was obtained from block caving; and (3) the increased demand for shorts permitted milling of rock which previously went to waste.

The better recovery is entirely due to increased production of shorts. Thus in 1951 the asbestos content in the Canadian ore as mined was 7.86% (9.71% as milled), compared with 7.13% and 10.59% respectively in 1950. Thus more fiber was extracted from the rock as mined, and less sorting achieved to effect mill-feed. For 1952 it is estimated that the tonnage of ore mined and milled, and percentage extracted will be about the same as they were in the preceding year.

World News in Brief

Johns-Manville operations at Asbestos, Quebec, are producing over 500,000 tons of asbestos yearly—over a third of the world's. Production for the huge open pit at this property is gradually being superseded by tonnages from underground caving operations. A multi-million-dollar mill replacement project is now under way. The company's Ontario property continues production at an annual rate of about 30,000 tons. Last year the company announced plans to participate in the development of an asbestos property at Mashaba, in the Victoria district of Southern Rhodesia. Associates in this venture are British Metals Corp., Ltd.; Anglo-Huronian, Ltd.; Southern Minerals & Marketing Corp.; and the Simon I. Patino interests.

Johns-Manville is also participating in a new company formed to further explore deposits in Antioquia, Colombia—to be known as Asbestos Colombianos, S.A.

At Thetford, Black Lake and Vimy Ridge, Quebec, the Asbestos Corp.'s four mines operated during 1952 at about the same capacity as in 1951. The exception was the Beaver, where, due to the continuous operation of the Aerofall mill in the "B" unit, the hourly rate was raised to an average of 150 to 160 tons. The Aerofall mill at the Beaver has been handling 40-45 tons of rock per hour.

The corporation's new Normandie mill will be of radically new design as compared to the orthodox Quebec flowsheet. It will incorporate six Aerofall units. The plant site has been leveled and prepared for construction. Stripping of the new orebody continues. The company is milling at the rate of 600 tons of rock an hour in its four mills.

Johnson Co.'s new mill construction program at Black Lake is well under way. The plant will handle about 4,000 tons of feed daily, and the expansion will cost about $6-million. Erection of the plant is progressing rapidly and production is expected to start sometime in 1953.

Nicolet is running at the rate of 2,800 tons of ore daily. Bell, now operating entirely from block-caving ore, is running at a daily rate of 2,500 tons. Flintkote, which started production in 1946, operates its mill at a new high rate of 1,500 tons. Quebec Asbestos is still milling 1,000 tons of ore daily.

At South Ham, Que., Dominion Asbestos, Ltd., is building a new mill to operate on a comparatively short-fiber property. Capacity will be about 100 tons of rock per hour. Production is contemplated for 1953.

At Black Lake, United Asbestos is reported to have approved an agreement with Lake Asbestos of Quebec, Ltd., for further expenditure of funds at its mine. This latter company is a subsidiary of American Smelting & Refining Co., and a mill of 4,000 tons daily is being discussed.

Garrison Township, in Ontario, has become extremely active since Johns-Manville completed diamond drilling at the Byrd group of claims. One of the largest asbestos companies is reported to be ready to start stripping on their proven asbestos property of major proportions, and mill construction may start soon.

In British Columbia, Cassiar Asbestos Corp., Ltd., with its phenomenal mine in the McDame Lake area is ready for production. The company's official reports state that the fiber-bearing outcrops have been developed over a strike length of 3,000 ft. A saddle-like mantle of asbestos talus overlies an ultramafic dike. An adit has been driven into the footwall of this dike disclosing a width of 251 ft. of continuous ore, with an average back above the adit of 250 ft. Bulk sampling and mill tests indicate an average recovery of 7% 3-K plus an additional 5% of 4-K, amounting to a place value of rock and talus of $38.75 per ton.

The Cassiar fiber is of the nonferrous variety occurring sparingly in Arizona. South Africa is the only major producer. Production at Cassiar is scheduled to start in July 1953 at a milling rate of about 150 to 225 tons per day. The first year's production is estimated to be 100 tons of crudes, 3,780 to 5,600 tons of 3-K (spinning), and 2,700 to 4,000 tons of 4-K (shingle). Capacity of the mill will be increased later to 500 tons per day. On the basis of 180,000 tons of rock annually, the estimated production is 150 tons of crudes, 12,600 tons of 3-K, and 9,000 tons of 4-K. Thus a single high-grade property would be in a position to produce a fifth of Canada's output of crudes, about a third of the spinning grades, and a twentieth of the shingle grade. Estimates of ore reserves now stand at about 5,892,000 tons of rock, and 280,000 tons of talus.

In Newfoundland, the 12½-tph mill of Newfoundland Asbestos, Ltd., will be completed in the spring of 1953.

In the United States, production still comes primarily from Vermont where Ruberoid's mill is operating at 100 tons per hour. Arizona producers are increasing production of iron-free chrysotile. In the Globe region, the Jaquays Mining Co. reports an important new discovery of soft fiber, and Metate Asbestos Corp. also reports a large strike at their Apache mine. In North Carolina, the newly formed Mining & Milling Corp. of America started milling anthophyllite late in 1952. The first unit of the mill is capable of producing 15,000 to 20,000 tons of fiber annually. Initial production will be shorts, but longer fibers will be turned out in the near future.

Canadian Producers' Shipments of Asbestos

IN SHORT TONS

	1951 (First 10 mo's)	1952 (First 10 mo's)
QUEBEC—		
Crude	646	617
Spinning stocks	27,460	29,523
Shingle stocks	135,078	146,842
Paper stocks	92,167	97,915
Waste, stucco or plaster	185,082	177,440
Refuse or shorts	332,240	282,360
Sand	24,202	27,785
Total	796,875	762,482
CANADA	819,899	781,581
EXPORTS OF ASBESTOS FROM CANADA		
Crude	577	564
Milled fibers	272,182	276,124
Waste, refuse, shorts	524,738	466,915
Total	797,497	743,603

More African Producers

In Africa many small independent producers have sprung up in Union of South Africa, Rhodesia, Swaziland, and elsewhere. In Rhodesia monthly production of chrysotile continued at a slightly accelerated rate over 1951 when fiber produced totaled 77,663 tons, valued at £5,452,108. In Swaziland, the Havelock mine of Turner & Newall is producing about 2,500 to 3,000 tons of bagged asbestos monthly. The Union of South Africa continues to produce about 2,500 tons per month, of which two-thirds is exported to

England, and the balance to the U. S.

For the first nine months of 1952, Cyprus produced 14,210 tons of fiber—all from the Amiandos mine. Production for the full year should be about 17,000 tons.

Production in Italy remained almost the same as for the previous year, and will probably total about 30,000 tons of chrysotile and tremolite. Group III and IV fiber must be imported to maintain the production of asbestos-cement products from the Eternit and other plants.

Australia is slowly increasing production of chrysotile and crocidolite. Production amounts to about 1,200 to 1,500 tons of each variety annually.

In Yugoslavia, an ambitious program is under way to exploit the country's large chrysotile potential. United Nations coupled with proposed aid from the United States should accelerate development of resources here. These might prove highly important since geologically there are seven large serpentine-peridotite massifs which are intruded by important bodies of acid rocks. The serpentines are similar to those in the Thetford-Black Lake region of Quebec.

Shortage Persists

At the year's close there was still little change in the critical shortage of practically all grades of asbestos crudes and fibers. The demand still remains high in all grades, although there has been the usual seasonal slacking-off in demand for the low fifth group material and the 6-D fibers. All other groups, including shorts, remain in strong demand, with critical shortages in Groups I through IV.

During 1952 the National Securities Resources Board published a monumental document entitled "Asbestos" in which world reserves were estimated to be adequate for at least 25 to 30 years "at current or moderately enlarged rates of output." From personal observation in many areas, it is the belief of this reviewer that favorable areas for further discoveries exist in Venezuela, Yugoslavia, the deeply drift-covered areas in the Thetford-Danville district of Quebec, and the serpentine massifs of the west coast of Canada and the U. S. It is also possible that strongly defined deposits in the Thetford area may continue considerably below present exploration limits—currently less than 2,000 ft.

Sulphur

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THE VIRTUAL END of the sulphur shortage in the United States and a decided improvement in the situation abroad were witnessed in 1952. Sulphur had been in short supply in the Free World since the outbreak of the war in Korea. The shortage had led to a series of usage and inventory controls in the United States and to allocation by our government of substantial tonnages for export to friendly nations. By November, however, the supply-demand picture had brightened to such a point that all controls on the use of sulphur in the United States were removed and consumers were once again free to place orders on an unrestricted basis.

Government estimates indicate that U. S. supply of sulphur in all forms in 1952 approximated 6,500,000 long tons. Of this, about 5,350,000 tons represented elemental sulphur, or brimstone, produced from salt dome deposits by the Frasch process, 250,000 tons represented brimstone recovered from gases and other sources, and 900,000 tons represented sulphur contained in such other forms as pyrites. The government estimated 1952 consumption, including exports, at 6-million tons.

The year began with a much less favorable relationship between supply and demand than that which ultimately occurred. Various controls had previously been applied, and as of Jan. 1, the government restricted the domestic consumption of sulphur to 90% of the 1950 rate plus additional allowances for defense and essential civilian uses. This program had, as an important objective, the maintaining of sulphur stockpiles, which had dropped to a point considered the minimum for national security.

Meanwhile, a number of forces had been operating to correct the shortage. Many projects to increase the supply of sulphur in different forms were being undertaken throughout the free world. Progress in conservation of sulphur was enabling some consuming industries to cut down on their sulphur use. And in certain industries, demand was lessened at times due to business conditions affecting them.

Outlook Encouraging

By July, the situation had improved to a point where practically all sulphur requirements at home were being met, and the needs of many consumers in other Free World countries were in large measure being satisfied. It was evident, too, that the outlook for the future was most encouraging as a result of the large number of new projects scheduled to increase the supply of sulphur in various forms during the 1952-55 period.

In August the government relaxed its consumer inventory controls, permitting consumers to increase their inventories from a 25-day to a 60-day supply. In November the National Production Authority removed all controls on the delivery, consumption, and stocking of sulphur in this country. The only remaining controls were those on the price of sulphur and on exports, which still were to be made under government direction. This action by NPA constituted an important step toward the return to a free economy.

In considering the outlook it should be remembered that sulphur is one of the earth's most abundant elements. Brimstone, of which the Gulf Coast salt dome deposits are the largest source, is one form. Other sources are native deposits, sour natural gas, petroleum refinery gases, smelter gases and pyrites. Sulphur comes to the market in other forms also, including the sulphur content of pyrites and the sulphuric acid made directly from various gases and sulphate minerals, such as anhydrite. Sulphuric acid, which accounts for four-fifths of all sulphur consumption, may be produced from any form of sulphur.

Brimstone Leading Source

The production of brimstone in the United States has been increased to a point 2½ times the 1935-39 level before World War II. Production of sulphur in other forms from other sources throughout the world, however, has not kept pace with that of U. S. brimstone. Where this form of sulphur once accounted for little more than one-fourth of production from all sources, it now supplies almost half of the world consumption.

In fact it was the foreign demand for U. S. brimstone which actually made us short of sulphur at home. U. S. production of sulphur was more than ample to supply needs of domestic industry, but because of our commitments to help our allies abroad, a system of export alloca-

tions was necessary. After filling the export quotas, there was not enough sulphur to meet the full domestic demand.

In the new developments, U. S. brimstone is continuing to play a major role. The new projects listed for completion in 1952-55 include four new mines at salt dome deposits in Louisiana and Texas and the expansion of an existing mine.

One of the new mines, at Spindletop, long famous in the Texas oil industry, was placed in production in mid-summer by Texas Gulf Sulphur Co. Freeport's new mine at Bay Ste. Elaine in the Louisiana marshland began production in November with the first floating mining plant. The other two mines, both Freeport projects, are under construction at Garden Island Bay near the mouth of the Mississippi and at Nash dome near Houston, Texas. It is expected that they will be completed around the end of 1953. The existing mine where facilities are being expanded is that of Texas Gulf Sulphur at Moss Bluff in Texas.

Sulphur From Gases

A large amount of activity is taking place to increase the supply of sulphur from sources other than salt dome deposits. While these projects are individually small, taken together they represent a significant addition to the overall supply. Most of them are for the recovery of sulphur from hydrocarbon gases. In the past the removal of hydrogen sulphide from sour natural gas and from petroleum refinery gas was primarily for the purpose of eliminating a harmful impurity or to prevent atmospheric pollution, but the shortage provided an additional incentive for projects of this kind. There are also efforts under way to utilize some pyrites and surface deposits of sulphur and to obtain larger amounts of this mineral as sulphuric acid from the sulphur dioxide in smelter gases.

The effect of a good deal of this activity will be felt in 1953. Government estimates place the U. S. supply of sulphur in all forms for this year at 7-million long tons. Consumption including exports has been estimated at about 6,600,000 tons.

Elsewhere in the Free World a great many other projects are under way to increase the supply of sulphur. It has been estimated that these projects, together with the brimstone and other undertakings in the United States, will increase the Free World's productive capacity by 4-million long tons per year by the end of 1955. Current output is estimated to be on the order of 12-million tons.

The outlook, thus, is encouraging. If present production is maintained and the new sources measure up to expectations, there should be enough sulphur for everybody. Sulphur in various forms occurs plentifully in nature. Unless artificial restrictions prevent, it should move in plentiful volume to the markets of the world.

Fluorspar

HUBERT W. DAVIS
Commodity Specialist
Bureau of Mines

FOR THE FIRST TIME, imports of fluorspar into the United States in 1952 may exceed domestic production, and consumption will exceed 500,000 tons.

Consumption of fluorspar in the United States in 1952 will, it is estimated, reach the unprecedented total of 515,000 short tons, a 4% gain over the former record established in 1951. The steel industry continued to be the predominant user, consuming about 52%. Chiefly because of the steel strike, this usage (about 267,000 tons) was about 3% less than the record high of 1951.

Consumption in the manufacture of fluorine chemicals (hydrofluoric acid, synthetic cryolite, aluminum fluoride, etc.), the second largest user, established a new record of 181,000 tons in 1952, or 19% greater than the former high of 1951. The fluorine-chemical industry accounted for about 35% of the total fluorspar consumed in 1952. Fluorspar was consumed by the glass trade at a slightly lower rate than in 1951, but there was a substantial decline in usage by the enamel industry.

Despite the record demand, domestic production in 1952 was only slightly greater than in 1951 but shipments declined about 5%. Production and shipments are estimated at 345,000 and 330,000 tons, respectively, in 1952. Domestic production again fell far short of meeting requirements of industry and the higher rate of government stockpiling of acid-grade. Production of metallurgical-grade fluorspar in 1952 was about 5% smaller than in 1951 and about 38% less than consumption in steel plants in 1952. Shipments of metallurgical-grade fluorspar from the Illinois-Kentucky district were 24% less than in 1951 compared with a gain of 38% in other producing states. The wide disparity between domestic production and consumption of metallurgical-grade fluorspar continued in 1952. During the four years 1949 to 1952 domestic production has supplied only about 62% of the requirements of metallurgical-grade fluorspar, compared with 83% in 1948. An appreciable increase in production is anticipated in 1953.

Consumption of fluorspar in the United States, 1951-1952, by industries, in short tons

Industry	1951	1952 (estimated)
Steel	276,654	267,000
Fluorine chemicals	151,698	181,000
Glass	35,505	34,000
Enamel	6,736	5,000
Other	26,419	28,000
	497,012	515,000

Although production of acid-grade fluorspar from domestic ore was about 15% greater than in 1951, it was 20% less than consumption for making fluorine chemicals. Shipments of acid-grade fluorspar from the Illinois-Kentucky district were 13% more than in 1951, compared with a like gain in other producing states.

Initial shipments of metallurgical-grade fluorspar were made from the Crystal Mountain mine near Darby, Mont. United States Steel Co. was in process of installing a Heavy-Media and flotation plant at Mexico, Ky. Minerva Oil Co., operating near Cave in Rock, Ill., purchased the Crystal mine, and the Jefferson mine and the heavy-medium mill serving them, from Crystal Fluorspar Co., Inc., and the Rose Creek mine near Herod, Ill., from Yingling Mining Co.

Ozark-Mahoning Co.'s new flotation mill at Northgate, Colo., began operating in July and the new flotation mill of Kaiser Aluminum & Chemical Co., at Fallon, Nev., in late September. Initial shipments of concentrates from the flotation plant of Pennsylvania Salt Mfg. Co., Marion, Ky., were made to its hydrofluoric-acid plant at Calvert City, Ky.

At the end of 1952 the total capacity of flotation plants in the United States that produce fluor-

spar for making fluorine chemicals was about 235,000 tons.

St. Lawrence Fluorspar, Inc., planned to begin building a 300-ton flotation mill at Wilmington, Del., in December; completion date is Aug., 1953. Construction of a heavy-medium plant at St. Lawrence, Newfoundland, which will have a capacity of 40 tons per hour, will be started early in 1953. The company is prospecting extensively in Newfoundland. It hopes to produce about 100,000 tons annually of mill-fed product from its heavy-medium plant.

Imports established a new record. During the first nine months they were 269,539 short tons, compared with 109,303 tons in the corresponding period 1951 and with 181,275 tons in the entire year. Mexico continued the chief source. Imports from there during the first nine months were nearly 3½ times those in the corresponding period of 1951 and were the highest on record. In the first nine months more fluorspar was also received from Italy, Germany, Spain, Union of South Africa, Tunisia, and French Morocco. These gains were slightly offset by smaller imports from Canada, France, and Algeria.

Metallurgical-grade fluorspar with 70% or more effective calcium fluoride content was quoted at $43 a short ton f.o.b. Illinois-Kentucky throughout 1952. Imported metallurgical grade was quoted at $38-$40 a short ton at Atlantic seaboard, duty-paid. Acid-grade fluorspar was quoted at $60 a short ton f.o.b. Rosiclare, Ill., and Boulder and Northgate, Colo. Acid-grade fluorspar was quoted at $65 a short ton f.o.b. Las Lunas, N. M., until July 10, when it was reduced to $60. Ceramic-grade fluorspar (95% CaF_2), in bulk, was quoted at $45 a short ton f.o.b. Rosiclare, Ill.

Stocks Up

The new supply of fluorspar made available in 1952 was sufficient to permit an increase in stocks of consumers and for a substantial accretion of acid-grade fluorspar to the government stockpile. Stocks held by consumers increased from 169,000 tons on Jan. 1, 1952, to 231,000 tons on Oct. 31. This was sufficient for less than five months' consumption at the October rate of usage. Stocks held by producers continued abnormally low.

Consumption of fluorspar in 1953 will approximate 575,000 short tons, chiefly because of expanded outputs of steel and fluorine chemicals.

DISTRIBUTION OF PRODUCERS having membership in the Perlite Institute, 10 E. 40th St., New York, is given by the dots. They are 47 in number. Map is published by courtesy of the Perlite Institute.

Perlite

S. W. JOHNSON, President
Texas Panacalite Co.
Irving, Texas

PERLITE, a relative newcomer in the field of lightweight aggregates, has enjoyed phenomenal growth as pointed up in a recent release by the U. S. Bureau of Mines MMS No. 2100 giving production and consumption data on the industry through 1951. The report makes the following statement:

"Virtually unknown on a commercial basis prior to World War II, production of expanded perlite in 1951 was 33 times greater than in 1946. Total output of expanded perlite in 1951 reached 134,479 short tons, and the quantity of expanded perlite sold or used was 133,175 short tons, valued at $7,243,298. The quantity of crude rock sold or used by producers was 181,588 short tons, valued at $809,971. The difference between the quantity of crude sold or used at own plant and the quantity of expanded material sold is accounted for by losses in transit, unexpandable material in the furnace feed, unsalable fines produced, stocks in transit or in storage, and the loss of moisture weight during furnacing."

The report contains a table listing United States production and consumption in 1951. No overall figures are available for 1952. However, from information obtained from the Perlite Institute, which has an accurate record of production and sales of Institute members, overall production and consumption figures for 1952 can be roughly estimated and figures for the two years are set forth in the table below. I have been unable to obtain any figures on exports or imports. Undoubtedly these were small.

Data given in the table is based on the best information available but, as Bureau of Mines figures are not in for 1952, there is no accurate data other than the figures of the Perlite Institute. Such data covers only Institute members. What percentage Institute figures bear to the total can only be estimated.

I am inclined to think the value of crude perlite per ton sold in 1951 as reported by the Bureau of Mines is low. The average price indicated by Bureau figures is $4.46 per ton, while of the three or four major producers of perlite ore none were selling below $6.50 per ton, ranging to as much as $9 per ton f.o.b mine.

In my estimate of value of perlite ore sold, I have used an average value of $7.50 per ton f.o.b. mine, which I believe will be close to the average price paid by expanders. Crude perlite is sold to the expander crushed and sized to meet definite specifications, depending upon the expanded product to be produced, and the price per ton varies with the gradation.

The majority of expanders package their product in 4-cu.-ft. two- or three-ply paper bags. Price per bag varied widely from coast to coast but probably averaged about 90¢ per 4-cu.-ft. bag f.o.b. plant.

Year	Crude Perlite					Expanded Perlite		
	Produced	Sold		Used at Own Plant to Make Expanded Material		Produced	Sold	
	Short Tons	Short Tons	Value	Short Tons	Value	Short Tons	Short Tons	Value
[1]1951	182,260	138,205	$615,853	43,383	$194,118	134,479	133,175	$7,243,298
[2]1952	206,000	156,000	1,170,000	49,000	220,000	151,500	150,000	8,100,000

[1] U.S. Bureau of Mines report MMS No. 2100. [2] Estimated from data available.

There were active mines in seven western states in both 1951 and 1952, about 87% of production coming from Nevada, New Mexico and Colorado.

Expanding plants were located in 27 states in 1951 and 32 states in 1952. The rapid growth of the industry in recent years reflects its geographical expansion from the west to the east coast. There are indications that the rate of growth is leveling off as expanding plants fill up geographical areas and cover new market areas. Future growth will depend less on expansion into new geographical markets and more on intensive selling in existing markets, as well as the development and exploitation of new uses for the versatile volcanic glass.

The basic markets for perlite aggregate have been as replacement for sand in plaster and concrete, where its function has been to decrease weight, increase insulation and fireproofing. Perlite-gypsum plaster weighs one-third as much as ordinary sand plaster and has about six times greater insulating or fireproofing value. Perlite concrete can be designed with only one-seventh the weight of sand-gravel concrete, having up to 20 times the insulating and fireproofing value.

In 1952, lightweight perlite plaster and concrete made possible the unusual lightweight design of such notable buildings as the Alcoa and U. S. Steel Co. buildings in Pittsburgh and the United Nations General Assembly building in New York City. In home construction, perlite plaster added valuable insulation and cut 3 to 4 tons of deadweight from the walls of each of thousands of FHA and privately built homes throughout the country.

As new geographical market areas became exhausted by expanders, competition for plaster and concrete aggregate business became increasingly severe and resulted in more attention being given to new uses. New uses

(Continued on page 240)

Barite

JOHN LLOYD
National Lead Co.
111 Broadway
New York

DOMESTIC PRODUCTION of barite in 1952 increased over the 1951 figure of 860,669 tons and probably exceeded the record of 884,219 tons produced in 1947. The United States continues to be the world's largest leading producer.

No new major sources were exploited in 1952. Arkansas again leads in barite production, with Missouri, Nevada and Georgia next in importance. Production is also derived from Arizona, South Carolina, Tennessee, Montana, New Mexico and others.

Demand accelerated during 1952 on the part of the oil-well drilling industry and the chemical industry, which are the principal consumers. For the chemical industry, high purity is required with low iron and silica content. For use as drilling mud, the product must have a high specific gravity as well as desirable mud-making properties when ground to approximately 325 mesh.

Consumption of barite in the United States in 1952 in well drilling and various chemical industries is estimated to have increased over the 1951 figures of 594,668 and 239,000 tons respectively. Use in concrete aggregate, paint, glass and rubber industries accounted for the balance of the 1952 consumption which is estimated at a total of approximately 1-million tons.

Imports of crude barite increased in 1952, most of which came from deposits in Nova Scotia, Yugoslavia and Mexico.

Production by States. In 1952 Arkansas was still the leading producer by a large margin. The Arkansas ores are low-grade and require concentration by flotation. Mining is by open-pit and underground methods. Most of Arkansas' production is accounted for by two operators and is consumed in the oil-well drilling industry. Barite production from Arkansas during 1952 increased over the 1951 figure of 407,085 tons.

Missouri is the largest domestic source of crude barite of chemical grade. Increased tonnages of ground barite for the drilling industry were also produced there in 1952. Production is derived largely from log-washer and jig plants. Some operators reduce the iron, lead and silica content of the lower-grade ores, for the chemical industry, by tabling, decrepitation and magnetic separation.

Demands for Nevada ore were met by numerous operators. It is estimated that production in 1952 increased over the 1951 figure of 63,201 tons. While very little barite was mined in California in 1952, a large portion of the Nevada mine production is processed in California, for both chemical and oil-well drilling use.

Sources of Georgia production were from open-pit mining and tailing pond reclamation, with concentration by flotation. Arizona production is derived from an underground mining operation and a flotation plant near Mesa. Idaho production continued from an open-pit mine near Hailey followed by dry grinding, for the drilling industry. Limited production was also derived from New Mexico, South Carolina, Tennessee and Montana.

Plants are being built in Corpus Christi, Tex., and Harvey, La., for grinding ore from foreign and domestic sources for oil-well drilling use in the Gulf Coast area. For the same market in the northwest a plant is being built in Montana for processing ore derived from an underground operation near Missoula. In Missouri a dry-grinding plant has been expanded and a new magnetic-separation plant has been completed.

Imports. Crude barite imported increased over the 1951 figure of

(Continued on page 242)

Feldspar

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Bureau of Mines

REALIGNMENT OF PRODUCTION interests in the feldspar industry occurred in 1952 when International Minerals and Chemical Corp. acquired Consolidated Feldspar Corp., the largest producer in the United States, and American Encaustic Tile Co. purchased a controlling interest in United Feldspar and Minerals Corp.

The feldspar grinding mill of United Feldspar at Spruce Pine, N. C. burned in Jan. 1952 and no plans have been made to rebuild it or to continue mining feldspar in North Carolina. Feldspar properties of this company in Maine will continue to operate. During the year, United's general offices were moved to Greensboro, N. C.

Based on trends for nine months, production of crude feldspar in 1952 will be somewhat less than the 1951 output of 400,439 long tons. Production of ground feldspar is expected to decline from the 454,615 short tons processed in 1951. North Carolina is expected to produce about 45% of the total mined and ground tonnage in the United States in 1952.

Of the three principal consuming industries, glass, pottery, and enameling, only the first is expected to use as much feldspar in 1952 as in 1951. Reduced domestic pottery production and consequent reduced demand for feldspar were caused by competition from imports, especially of vitreous china and wall tile, and substitutes for domestic pottery products. In 1952, demand for feldspar in the enameling industry was less than in 1951 because of steel shortage, emergency regulations and reduced production of household appliances.

Statistics for nine months indicate that feldspar imports in 1952 will be small. Crude nepheline syenite imports continued to decline and only small spot shipments were received. The imports of ground nepheline syenite, based on statistics for the first nine months, probably will decrease 5 to 8% compared with 1951.

The glass, pottery, and enamel industries can be expected to consume about 99% of all ground feldspar in 1952, the same percentage as for several successive past years.

Mica

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Chief Ceramic and Fertilizer
Materials Branch
Bureau of Mines

PROGRESS WAS MADE in 1952 toward alleviating domestic shortages of strategic grades and qualities of muscovite mica block and film. Subsidized domestic production and extended purchase contracts for imported mica for the stockpile are becoming effective in the short range view, and substitutes, alternate and synthetic materials, are approaching reality to meet future strategic requirements. However, actual supplies of strategic mica were less in 1952 than in 1951 because of decreased imports of block and film mica from India which were only partly offset by increased imports from other countries.

Imports of muscovite block and film mica in 1952 are estimated at about 4-million lb. compared with about 4.8-million in 1951. Imports of Indian muscovite splittings in 1952 are estimated at about 7.6-million lb. compared with 18.3 million in 1951. Supplies of both muscovite and phlogopite splittings were adequate for industry requirements. Present stockpile objectives of splittings were met in 1951.

On March 14, 1952, the General Services Administration announced a long-range purchase program for domestic hand-cobbed muscovite ruby crude mica and processed muscovite ruby block and film mica to encourage discovery, development and production of this critical mineral. This program will continue until June 30, 1955, or when the equivalent of 25,000 short tons of hand-cobbed mica has been purchased, whichever first occurs. Purchase depots have been established at Franklin, N. H.; Spruce Pine, N. C.; and Custer, S. D. The purchase price for hand-cobbed mica is $600 per short ton. Prices ranging from $2 to $70 per lb. are paid for processed block and film mica, depending upon grade, quality and whether the mica is half or full-trimmed. At the end of November 1952, the equivalent of approximately 450 short tons of hand-cobbed mica had been accepted. The average price paid for processed mica at Spruce Pine was $15.50 per lb.; that at Custer was more than $9. The quantity purchased at Franklin through Nov. 30, 1952, was insufficient to develop a meaningful average price.

During 1952 the GSA contracted with 11 importers for purchase over a three-year period of a maximum of 4,557,250 lb. of muscovite block and film mica from Brazil, India, Angola and Tanganyika.

DMEA received 89 applications for exploration assistance in the first 11 months of 1952 and awarded 39 contracts totaling $264,230. The government will pay 90% of actual exploration costs. From 22 terminated and four completed contracts, DMEA certified five discoveries.

Last spring, General Electric Co. released trade bulletins describing a sheet mica derived from scrap mica instead of imported splittings.

The Mica Insulator Co., Schenectady, N. Y., licensee of the Swiss-French Samica patents for reconstituted mica products made from scrap mica, built a plant at Rutland, Vt. to produce Samaica.

It is anticipated that reconstituted mica ultimately will replace the need for imported splittings in production of built-up mica products. Few miners and grinders can supply raw material to meet present specifications. It is expected that these will be modified.

Bureau Has Product

Synthetic mica, chiefly fluorphlogopite, produced by the Bureau of Mines Electrotechnical Laboratory, Norris, Tenn., is arousing interest as a potential raw material in glass-bonded mica ceramics, reconstituted mica sheets, and machinable hot-pressed mica dielectrics. Even though it may not be feasible to produce large sheets of synthetic mica, it may be possible to use synthetic flake in built-up products.

Equipment for the mass production of microfilm glass capacitors is being developed for Corning Glass Co. The product will replace strategic mica in many capacitors.

Germanium transistors are in production and may supplant most electronic tubes and a substantial part of the mica capacitors now required in radio and television circuits, thus reducing mica needs.

During the year, the American Society for Testing Materials tentatively adopted two sets of mica specifications: D351-52T, "Natural Muscovite Mica Based on Visual Quality" and D748-52T, "Natural Block Mica and Mica Films Suitable for Use in Fixed Mica Dielectric Capacitors."

DESIGNED ESPECIALLY FOR AIRLEG DRILLING, the newly developed Jackdrill is intended for use as stoper, drifter, or jackhammer. Feed leg does not require separate air hose. Total weight with airleg is 88 lb. See also p. 112.

Tungsten Carbide Drilling Takes the Lead

A. H. HUBBELL
Managing Editor

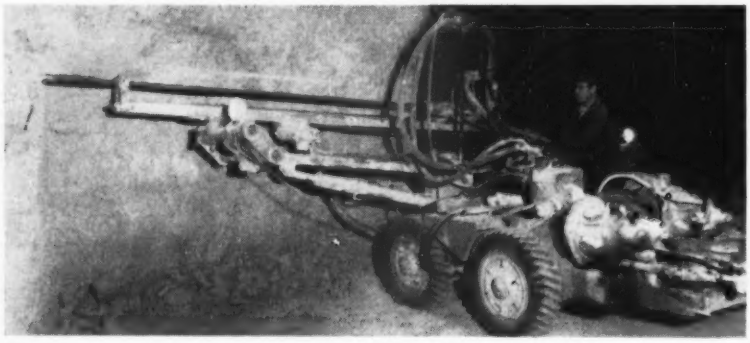
TUNGSTEN-CARBIDE DRILLING is finding wider acceptance, whether with detachable insert bits or tipped forged steel. The advantages of airleg drilling are a factor, also the advantages of the smaller hole. Nothing, however, sugests eventual universal adoption of carbide drilling. There is much ground, as in Butte, where an ordinary steel bit will do. The throwaway aspect of the single-pass bit also has its advantages. The idea of a general purpose mode of drilling, moreover, is attractive but not likely to be realized, save possibly in individual properties. The variables in drilling are many. At the same time, research into drilling is active and widespread.

The continued growth in use of carbide is illustrated in Homestake Mining Co.'s current practice. This operator went some years ago to one-use steel bits for all drilling in stopes and drifts. Today these have been replaced with carbide bits in drifts and raises, and the change is also being made in stopes as fast as lightweight hammer drills and airlegs can be obtained. The reason is found in lower costs arising from the increased tonnage per man-shift.

Another instance of this trend is in the case of a large mid-western company that has been using single-use bits extensively. Recently it has been testing airleg equipment with carbide-tipped steel and, from data obtained, thinks it can save money that way by changing.

Sweeping generalizations are to be avoided. Most mining companies are using more than one kind of drilling medium. Both carbide bits and single-use bits are to be found in many mines, in varying degrees of application. Bunker Hill & Sullivan, in Idaho, provides an instance. There, 90% of the drilling is being done with Throwaway Bit Corporation's single-pass bits, large and small, and 10% with carbide bits. Bunker Hill is using airleg-mounted machines increasingly, but with the small Throwaway bits and ⅞-in. hex. steel, at the same time using powder as small

THIS SCOOP SHOVEL is used by International Salt Co. in its mine at Detroit primarily for removing 50 to 60-ton fillet of salt left by big dipper-stick shovel at the working face. See pages 117, 118, 119.



LONG-FEED DRILLMOBILE has twin jibs capable of handling 10-ft. feed. It has been developed primarily for mining in some limestone deposits. Self-propelled it carries its own compressor plant.

as ⅞-in. with a saving in blasting costs.

Butte mines employ Liddicoat single-pass bits almost exclusively, but there are places where the carbide bit could be used to advantage, as in shaft sinking. In such work, it is said, it would save clutter in the bottom.

Interestingly, the Western Rock Bit Co., makers of the Liddicoat single-use bit, which is finding wide use, is also offering a new carbide-insert bit—the Tee Cee Liddicoat bit—for "fast drilling and long life." There is no conflict between the two bits, the company says. The former will continue to be used for general drilling conditions and the latter where conditions justify the expense. The Throwaway Bit Corp., of Portland, Ore., makers of the Throwaway single-use bit, are also developing carbide-insert bits, as told in more detail on the opposite page.

One may note that the single-pass bit has become a multiple-use bit in places, notably in South Africa, where this stroke of economy cut the number of bits sold as single-use bits by 22% in 1951. This trick may be catching. Belleterre Quebec Mines, where single-pass P. & M. bits are in general use, has started to regrind them and expects to get three or four usages out of them. (They are reground cold on a tapered stone and no heat-treatment is necessary.)

Airleg's Popularity Continues

Airleg drilling with jackhammers and carbide-tipped steel or carbide bits continues to grow in favor. Advantages are numerous. Drilling is faster, less time is spent in setting up, drills are easier to handle, various savings in air and powder are possible, all summing up to give more tons per man-shift and lower costs.

Recently other drills than the Atlas Diesel machines first used have been introduced for this type of drilling. American, Canadian and European makers have contributed. The changes experienced by 16 early users of this lightweight equipment in Canada were discussed in *E&MJ*, Dec., 1952, pp. 105-108.

Ingersoll-Rand has brought out what it claims is the first drill especially designed for an airleg. This is the JR-38 Jackdrill (page 111) for use in combination with the 1⅜-in. Series 113 Carset Jackbit and ⅞-in. hex. alloy-steel rods. It is for use as stoper, drifter or jackhammer. Total weight with airleg is 88 lb. The separate air hose going to feed leg is eliminated. A tool called the Jackroll for rolling the undercut of rods to eliminate breakage at the base of the thread was also developed, by Ingersoll-Rand (see *E&MJ*, April, 1952, pp. 100-101).

Gardner-Denver likewise has a light airleg-mounted drill for carbide drilling—the S48 sinker, an easily handled machine in the 45-lb. class for which are claimed the speed and power of a heavier drill. Other features are its ability to drill wet or dry without change of more than the backhead gland and tube, and to clean the hole well while running. This drill is shown on p. 114.

As the Drill Man Sees It

Copco Pacific, who distribute the Swedish Atlas drills and Coromant alloy steel in the U. S. and Mexico, claim more than 500 customers in 11 western states. Most large operators, they say, have tested the equipment. New factories which they have in Canada insure their ability to supply drills, parts, or steel. The standard RH656 Atlas drill has been improved. To meet varied conditions, a lighter machine, RH571, and a heavier one, RH754, have been introduced. This equipment has also been introduced in the East, South and Mid-West by Copco Eastern, Ltd., Paterson, N. J., set up in 1952. Copco officials cite favorable comment by various western mining companies on their equipment, including Dickey Exploration Co. and Central Eureka Mining Corp., in California; Golden Cycle Corp., Wellington Mine, and U. S. Metals Corp., in Colorado.

The Trend in Drilling

Comment from various manufacturers on the trend follows:

A Company Making Carbide Bits, Multiple-and Single-Use Steel Bits. The chief products engineer points out the existence of a greater and wider use of detachable carbide bits. Efforts are being made to get greater economic benefit from them. . . . Where multiple-use steel bits can be used economically, actual consumption is increasing. This should apply to single-use bits, but actual consumption here

Highlights of Underground Mining Practice

TUNGSTEN-CARBIDE DRILLING has made great gains, if our Survey's sampling of current practice is truly indicative of the situation.

SINGLE-PASS BITS appear to be yielding considerable ground to carbide bits.

AIRLEG DRILLING with carbide-tipped jumpers or detachable bits is still growing in popularity. Machines, legs and drilling media of American, Canadian and British origin are strongly in the picture, along with those of Swedish make.

HOLLOW ALLOY DRILL STEEL is gaining rapidly in use.

DRILL JUMBOS are becoming an essential for development work and finding wider use in stoping.

ROCK BOLTING is being widely tested and in some cases extensively adopted. Bolting is not the answer to all problems of ground support.

LONG-HOLE DRILLING with jointed rods and carbide or steel bits is gaining ground on diamond drilling for holes under, say, 100 ft. in length.

UNDERGROUND DIESEL HAULAGE continues to attract attention in United States and Canada. The number of locomotives in service is growing slowly. Discussion is widespread.

BELT CONVEYORS are becoming well established as a means of transport underground. Important installations are being made.

UNDERGROUND COMMUNICATION shows wide improvement, especially in connection with locomotive haulage, thanks to the widening use of the carrier-current telephone.

CONTINUOUS MINING is making marked gains in the non-metallic field, particularly in mining potash at Carlsbad.

seems to be off. . . . Where steel bits and carbide bits can be interchanged on the same threaded joint, it is an advantage which smart operators seize. . . . Full advantage will be taken of tipped steel where very small holes are required in connection with need for carbide drilling in ground where a chisel bit performs satisfactorily. . . . Four-point tipped forged steel will be at a definite economic disadvantage over the detachable carbide bit. . . . Limitations of the chisel bit are definite. . . . Remains to be seen whether minimum limit on gage size with the detachable-bit threaded construction has been reached. Some bit series are successful today with thread and gage sizes once thought impossible.

Single-use bits are performing well today under certain conditions. Doubtless there will be marked increase in use or application due to inherent difficulties in design, construction and economy of operation. The company's experience is that it is not economically competitive with the multi-use bit and cannot be used where the carbide bit is necessary.

Gardner-Denver Co. sees a continuing trend toward mining methods using long blast holes drilled by hammer drills, tungsten carbide bits, and sectional drill rods. . . . Former trend to smaller rock drills for use with carbide bits or inserted rods appears to be halting and reversing itself. . . . Airleg-mounted rock drills have been tried by most metal mines. Wide scope of application is definitely shown, but not universal. . . . There is a continued trend to jumbos where applicable, but feed-leg-mounted drills are desirable in many cases.

Holman Brothers, of Camborne, England, says:

1. With increasing experience, drill operators can handle a somewhat heavier drill on airlegs than those originally introduced. We have observed increased demand for a 2⅝-in. dia. machine. Increased drilling speed so obtained justifies a few pounds extra weight, now easily handled. Have supplied two standard diameters of leg, 2 in. and 2¾ in., the latter for low pressures. Latest model in smaller size is now 2⅜-in.

2. Have found much interest in use of 4-in. drifters for deep-hole drilling to replace diamond drilling, owing to high cost of diamonds. Percussive machine is satisfactory for holes above horizontal but difficulty remains in adequately sludging hole below the horizontal.

3. Dryductor drill, announced in December, 1950, is proving itself particularly suitable for roof bolting and for raising and overhand stoping where operator is subjected to discomfort from dust, when drilling dry, and from sludge when drilling wet.

For roof bolting the drill is secured to an improved stoper leg. In this the drill mount is extended rearwardly down the leg so that the total overall length of drill and leg is a minimum. A double telescopic extension is provided. Minimum overall length of machine and leg is 32 in. and maximum extension is 72 in.

The dust collecting unit has been improved, and is out of the laboratory stage.

A tendency has been noted to return to detachable carbide bits. Under certain conditions carbide-tipped steels are not the complete answer.

Drilling Developments As Shown by E. & M. J.'s Survey

U. S. and Abroad. The following items are culled from the responses resulting from *E&MJ's* inquiry. Space limitations forbid the use of all. *Nothing published during the past year is reprinted, in the main.* The difficulty of generalizing from such varied data should be apparent:

Throwaway Bit Corporation, Portland, Ore., is also developing carbide-insert bits, making about 50 different sizes and types of the company's Throwaway steel one-use bits. Sales of such bits to the soft rock mines and the coal mines using roof bolts have increased; also sales to foreign mines due to cheaper labor and less knowledge about the use of carbide-insert bits, according to Homer B. Morris, president. The company is also developing carbide-insert bits, of the slip-on and threaded types. Mr. Morris says that, in mines with very hard rock and high labor costs, some are changing to carbide-insert bits, even at a greater bit cost per foot of hole drilled.

Drill Bit & Tool Co., Pittsburgh, who also make Throwaway bits, has introduced a new type of bit for sandstone operations. It has more teeth overhang and a greater angle of clearance which permits chipped rock to be cleared faster. This bit is being made in the 1-in. socket series, 2¼-in. side hole or center hole. The range in wagon-drill bits is being increased to include 2½-in. and 2⅝-in. bits in the side-hole or center-hole type. This bit is the only detachable rock bit specifically made for this type of drilling. Distribution of bits has begun throughout the south.

Brunner & Lay Rock Bit Corp. is the new name of Rock Bit Sales & Service Co. Manufacture of the various carbide-tipped items has been moved from Philadelphia to a new plant at 9250 King St., Franklin Park, Ill.

Hayes Steel Products, Merritton, Ont., say they have improved the

MAKING A PLACE FOR ITSELF IN AIRLEG DRILLING is Gardner-Denver's S48 sinker, here seen. It is easily handled, being in the 45-lb class. It drills wet or dry, cleans hole well while running. See p. 112.

Hayes P. M. throwaway bit in design to make it adaptable for airleg drilling in place of carbide bits. One operator, they claim, has changed back from carbide to these bits entirely in consequence. They foresee greater use for P. M. bits. . . . Detachable carbide bits are finding greater use for long-hole drilling with jointed rods. Great care in steel preparation is still needed. Lack of facilities at many mines is causing excessive shank breakage. . . . Carbide-tipped forged steel is still the most popular carbide-drilling tool. Mines making their own are growing in number.

Thompson Products, Ltd., St. Catharines, Ont., makers of the Liddicoat single-use steel bit, think detachable carbide bits definitely have a market. They are currently manufacturing five types of carbide bits for the various steels that are to be used with the Liddicoat.

The tipped steel and airleg combination having become so popular, Thompson Products have developed a detachable carbide bit for ⅞-in hex. steel which has given excellent results with the airleg machine. They think a good detachable carbide bit has advantages over tipped steel; also that tipped steel has reached its peak. With greater competition from detachable carbide bits they forecast a decrease this year in the use of tipped steel.

East Malartic Gold Mines, Quebec, have changed over to detachable carbide bits from the Craig single-pass bit. Bit cost per ft. drilled is slightly lower. Performance per man-shift is much increased.

Granby Cons. M. S. & P. Co., British Columbia, is getting longer life from carbide-tipped steel by welding broken pieces of steel together, a process worked out by Canadian Copco using Dominion Oxygen Co. pressure welding machine. Have averaged 300 ft. of drilling with welded rods, and have had no failure through weld. Average life of new steel is 600 ft. Cost of weld is $2 against $18 for a new steel.

Large Canadian company in 1952 replaced all types of drill bits for percussion drilling with carbide-tipped forged steel made in mine shop. Compared with 1948-51 period, drill-steel shop costs per ft. drilled decreased 31%, average footage per man-shift increased 34%. In same period 1948-51, single-use bits accounted for 53% of total drilling; threaded carbide bits 35%; home-made tipped steel 5%; and other types 7%.

Quebec gold producer has standardized on Hayes 4-wing single-use bit, used mainly in softer zones. Harder, more abrasive ground is drilled with detachable carbide bits and tipped forged steel, on both of which tests are being made. Present standard detachable carbide bit is the CIR Carset 4-wing, 1½ in. round bit. Two main types of carbide-tipped forged steel are used: ⅞-in. hex. Coromant and one made by a local company.

Another gold company in Quebec is gradually replacing single-use steel bits with carbide-tipped forged steel, getting 350 ft. per steel to 3 ft. per single-use bit. Forged steel is sharpened every 25 ft.

Pioneer Gold, British Columbia, has replaced detachable steel bits entirely with carbide-tipped forged steel.

Powell Rouyn Gold Mines, Quebec, is testing Atlas RH754 airleg drill (the "heavier" drill mentioned on p. 112). This machine makes 3,050 strokes per min. with a hollow piston. Tests to date, confirmed elsewhere, indicate that drill will cut as fast in hard rock as in soft. This drill, on account of number of strokes, which are much lighter than in regular drill, is easy on carbide drill steel. Tests to date indicate that the footage per drill rod is at least 50% better than when using heavier and slower drill made by same company.

New Senator-Rouyn, Ltd., Quebec, in drilling blast holes with coupled rods and carbide bits, has changed from 1¾-in. bits, 1⅛-in. round rods, and 1⅝-in. O.D. couplings to 1½-in. bits, ⅞-in. hex. rods, and 1⅜-in. O.D. couplings. Average length is 50-60 ft., maximum a little over 100 ft. Rods are 2 ft. 10 in. long. Close spacing and small clearance of couplings are said to reduce vibrational whip. Results are very straight holes, good footage for bits and couplings. Lighter rods and equipment give higher footage per man-shift (about 90). Drill rods (⅞-in. hex.) are salvaged worn-out carbide-tipped steel.

American Smelting & Refining Co., Mexico, is increasing use of carbide-tipped forged steel with pusher-type one-man drills. In medium-to-hard ground this is faster and economical. Use of it will probably increase more.

O'okiep Copper Co., South Africa, has decided to reduce section and weight of drill steel for development work. Policy is to lighten all drilling equipment so that one native can drill a 5x7-ft. round by himself on an average. Formerly it took 4 to 5 natives to set up and drill off with conventional bar-mounted equipment. Using airleg-mounted 2⅝-in. jackhammers, the company is testing ⅞-in. hex. steel with 40-mm. carbide forged tips. This replaces 1-in. Q.O. steel. If test is successful, the 1-in. steel will be used only for drilling long blast holes.

Uses 4-pt. Tipped Steel

An Iron Mining Company, Birmingham, Ala., has standardized on 4-pt. carbide-tipped forged steel in both ore and roof drilling. Advantages over chisel-type inserts in roof-bolt drilling include better speed, longer life. For drilling in both ore and roof an alloy rod is used which gives better life compared to conventional steel.

Climax Molybdenum Co., Colorado, is using molybdenum sulphide on drill rod threads. This seems to facilitate

removing couplings and bits. Opinion of miners is that it is effective.

U. S. Smelting, Bayard, N. M., is testing Coromant tipped forged steel and Atlas drills; also sinker rock drills on airlegs.

Jackdrills in Tri-State

Eagle-Picher, Oklahoma, has in service several JR-38 Universal Jackdrills (see p. 111), using 1½-in. 113x CS4 detachable bits. One bit is 1⅞ in. in diameter. Drill steel is ⅞-in. hollow Double Diamond C A (chrome-moly). The drills are said to show promise of reducing drilling costs, though in very hard, highly abrasive or ravelly ground they have not had much success. With them more holes can be drilled than from post or tripod set-up. Holes are smooth, straight, load easily, take less powder. The Jackdrill has a place in drilling "bright spots" and in working on narrow benches where foot space is small. Most of the ore is broken by 3½-in. and 4-in. drifters.

An Iron Mining Company, Iron River, Mich., has a few lightweight jackhammers, and airlegs are on trial in main-level drifts and sub-drifts. Drill steel and bits used are either carbide Intraset rods or single-use detachable steel bits, depending upon ground conditions.

Mining Company in Pacific Northwest has converted 14 heavy I-R R58 stopers for use with ⅞-in. hex. Coromant steel. Drifting with the Swedish steel and drills was started in 1951.

American Zinc Co. of Tennessee has been brazing carbide inserts in carbon steel, using the Kennaset process. A Kennametal milling machine was purchased. Cost per foot of hole, which includes inserts, steel, material and the labor of preparing steel and brazing inserts, is averaging 2½¢, compared to 4¢ per foot with carbon steel and multi-use bits. This cost is expected to be reduced when the company's reconditioning or grinding program gets underway.

Use of airlegs with ⅞-in. alloy Intraset steel is proving successful. Experimental work, just completed, indicates that the footage and number of holes should be doubled per machine shift where they can be used.

Federal Mining & Smelting Co., in Idaho, is increasing its use of carbide-insert detachable bits, all of four-wing construction, in hard, abrasive ground. Where the rock is both abrasive and homogeneous, carbide-tipped forged steel (the chisel bit type) is giving the best results.

Howe Sound's Chelan Division, Washington, John J. Curzon, manager, has never before found airleg machines competitive in its ground. Recent tests with them, however, and with ⅞-in. alloy steel and 1⅜-in. carbide-insert detachable bits have shown definite possibilities.

An Iron Mining Company, New York, is trying out alloy drill rods but is having trouble with heat-treatment.

Tennessee Copper Co., Tennessee, changed over to carbide-insert bits January, 1952, but finds no improvement in cost results over detachable steel bits. In hard ground, better maintenance of production has resulted. There have been benefits to the drillers (contractors) and some to the company in longer headings. Average heading length increased about 1 ft. Chief weaknesses to date have been in bit and insert breakage, with thinking favoring detachable bits rather than tipped steel.

Mining Company, New Mexico, is trying several types of detachable carbide bits on 1-in. Q.O. steel used in 3-in. drifters in development headings. Results are not conclusive but indications are that these bits should be better than multiple-use steel bits.

United States Smelting, R. & M. Co., Utah, has replaced Leyner-type drills by jackhammers used with airlegs for about half of the drift and stope drilling at the Lark Section. Results have been satisfactory and more replacements will be made. At the US Section, 1¼-in. round drill steel with lugged shank was replaced by 1-in. QO steel with straight shank. About half the drills at the US Section were changed to accommodate the 1-in. steel, with the change continuing.

Marquette Range Trends

New trends at Cleveland-Cliffs mines on the Marquette Range are as follows:

1. Small hole drilling 1¼ to 1⅜-in. dia. at Cliffs Shaft mine, where ore is very hard, using light 2½-in. cylinder-bore machines with ⅞-in. hex. alloy-steel rods, and newly designed faster-hitting and light-blow machines. Bit life is approximately 50% greater with no noticeable change in penetration speed.

This small-hole drilling was started with expectation of cutting drilling costs in the hard-ore stopes (approximately 25% of the total mine producing areas), which at present are pulling the mine average life per bit down and raising cost-per-foot-drilled.

2. Leyner lugged steel is being tried in 1⅛-in. round and 1¼-in. round, made of both alloy and high-carbon steels.

3. Auger drilling is changing rapidly to rotary auger using tungsten-carbide auger cutters. See p. 116.

4. Collared shanks have been changed at the Cliffs Shaft and the Negaunee mine to the "pear-shaped shank." This new design of shank requires only one heat to forge, as compared with 4 to 5 heats for the old style collar. Indications to date are that the pear-shaped shank lasts 4 to 5 times longer than the old type.

Equipment in general use at Cleveland-Cliffs Iron Co.'s mines on Marquette Range, according to J. S. Westwater, district superintendent, Ishpeming, is as follows:

Bethlehem 1-in. Q.O. rods with collared shank and threaded bit ends using either the Timken H 1-in. thread or Ingersoll-Rand 115 Series, 15/16-in. thread. Bits used are the 1⅝-in. Timken, Rock Bit Sales & Service (now Brunner & Lay Rock Bit Corp.) or Ingersoll-Rand.

Jumbo-mounted machines used are most generally 3-in. cylinder-bore machines with 6-ft. change chain feeds. However, Cliffs Shaft mine uses 4-ft. change screw feeds with 2⅝-in. cylinder bore jackhammers or drifters, and at Negaunee mine 3½-in. drifters were used in one heading with 1¼-in. round lugged steel.

Alloy Drill Steel Up

Alloy Steel Long-Lasting. Representing the Crucible Steel Co. of America, W. H. McCormick and R. W. Persons told the Denver meeting of the Mining Congress last September that the growth in use of alloy drill steel from 7% of total drill steel in 1949 to 12% in 1950 and to 17% in 1951 indicates a trend toward use of smaller size of hollow drill-steel rods, as well as an increasing demand for the alloy hollow steel. A steel of fatigue life commensurate with bit life is needed with carbide-insert bits in view of the latter bits' long-lasting qualities. Alloy steel can help reduce costs, moreover, by increasing the footage drilled.

This growing demand poses new problems for the steel makers. "We steel makers," said McCormick and Persons, "still do not have the all-purpose alloy-steel rod which will lower your drilling costs without any more fuss or bother in fabrication than you have been accustomed to in the carbon steel. One must not assume that alloy steel is going to be any better than carbon steel. It must prove itself in your particular location." It becomes increasingly important, they advise, to follow the forging and treating recommendations furnished by the steel maker. Accurate and close control of these operations is essential.

More Drilling Aids

Use of Jumbos Grows. Appreciation of the advantages customarily realized with the jumbo in lessening labor and time required for drilling the round continues. Sidney Mining Co., Idaho, recently installed an Ingersoll-Rand two-boom jumbo in a long crosscut. Advance per round has increased 25% from 6 ft. to 7.5 ft., which is

Long-Hole Auger Drilling at Mather Mine "A" Shaft

LONG-HOLE AUGER DRILLING has become standard practice for effecting the undercut for a block cave at the Mather mine "A" shaft. Holes are drilled in a radial pattern at 55 deg. to 90 deg. from both sides of a circular, steel-supported transfer drift. Cleveland-Cliffs is the operator.

Drilling is done with Chicago-Pneumatic rotary drills of either 7½- or 12-hp. rating. Rods used are 2¼ in. x 3 ft. flight auger hard-surfaced drill steel with a ⅞-in. hex. button-type shank. In soft ore, the bits used are 2½-in., two-, three-, or four-prong hi-speed steel throwaway bits that are pinned to a slotted drill head. In ore that is firmer than is ordinarily met, a 2½-in. carbide-tipped bit with a ⅞-in. hex. shank is used instead of the drill head and the throwaway bit.

Time studies of the rotary drilling operations indicate a wide range of drilling speed in accordance with equipment and working conditions involved. Some examples of exceptionally good footage are:

1. Drilling in a medium-hard ore with 12-hp. C-P rotary drill and using a carbide-tipped bit: footage drilled, 177; actual drilling time, 21 min. 51 sec.; ft/min., 8.1.

2. Drilling in soft ore with 7½-hp. C-P rotary drill and using a two-prong throwaway bit, an actual drilling time of 4.89 ft. per min. was recorded.

3. Drilling in soft ore with 7½-hp. C-P rotary drill and using 3-prong throwaway bit, actual drilling time recorded was 4.85 ft. per min.

4. Drilling in soft ore with a 7½-hp. C-P rotary drill and using a three-prong throwaway bit, an actual drilling time of 3.9 ft. per minute was recorded.

credited largely to the jumbo. New Park Mining Co., Utah, has improved the footage in all major drifting jobs by using a single-boom jumbo.

On the other hand, a gold mining company in northern Quebec has tried its first jumbo and says that to date it has proved less advantageous than expected.

Climax Molybdenum, Colorado, has built a jumbo for a slusher drift by welding an arm between the bails of the folding scraper. On this arm a column can be mounted and raised into position in the heading by slusher hoist cables. It is possible that this jumbo could be used in other headings where a scraper is in use.

Joy's long-feed Drillmobile has been developed for underground drilling, particularly in some limestone deposits. It is shown in the picture on p. 112. It has twin jibs capable of handling a 10-ft. feed. It is self-propelled and carries its own compressed-air plant. The last has application in toe-hole drilling in open-pit work operation. Several are in service in the Southwest.

Better Lubrication. Howe Sound's Chelan Division, Washington, is experimenting with use of a chemical additive in rock drill lubricating oil. An improvement in the drill's lubrication is indicated, with a decrease in oil consumption.

Progress in Long-Hole Drilling

Long Holes Can Be Longer. Hitherto, approximately 60 ft. has been cited as the approximate economic limit for blast-holes drilled with rock drills, coupled rods, and tungsten carbide. Opinion has been expressed that this may be low and that, with improved equipment available, holes can be drilled economically up to, say, 100 ft. in length. One manufacturer of rods, bits and couplings has claimed that the limit can be even higher. Local conditions, of course, will govern.

Following are several case studies which are cited independently of the foregoing:

An Ontario Gold-Copper Company has made tests to compare performance of a 4-in. leyner-type drill, using 1-in. round rods and 2-in. carbide bits, with a 3½-in leyner-type machine using locally made rods and couplings with 1⅝-in. carbide bits. Average length of hole was 50 ft. Results indicate a lower cost per ton drilled for the latter machine and a 1⅝-in. bit. However, more tests will have to be made to compare long-hole drilling by leyner-type machines with diamond drilling before the latter standard method is discarded.

A Large Canadian Company has used, in a rock quarry where diamond drill costs were high, 3½-in. drifters with 1½-in. carbide-tipped rods of 1-in. Q.O. section and threaded sectional steel of 1-in. Q.O. section by 4 ft. long. Holes up to 50 ft. long were drilled successfully with this equipment at a cost per cu. yd. that was 33% less than with diamond drilling.

A Company in Ferry County, Washington, has virtually supplanted diamond drilling for exploration and development for hole lengths up to 180 ft. by means of long-hole drilling with coupled rods and carbide bits, using an independent water swivel.

Tennessee Copper Co. has experimented in long-hole drilling with Gardner-Denver equipment including 4-in. drifters, 2⅛-in. bits and rods in 3-ft. sections. Results show this is preferable to diamond drilling in ground hard enough to get reults in less than 75 ft. penetration per diamond bit. Maximum hole length for efficient work appears to be about 70 ft. Most of the holes are downholes, with heavy sludges which must be blown out before charging.

Homestake Mining Co., South Dakota, has used coupled alloy-steel rods during past year in drilling long test holes for sampling stope walls.

A Drilling Symposium

Diamond Drilling Trends. U. S. trends were discussed by R. D. Longyear, president, E. J. Longyear Co., in a comprehensive paper at the symposium on diamond drilling held in Johannesburg, South Africa. The price of diamonds will be an important factor in the future of the diamond-drilling industry.

Deep-hole drilling continues increasing. The deepest diamond-drill hole ever drilled in North America was completed by New Jersey Zinc Co. in 1952.

Bureau of Mines' work on orientation of diamonds in diamond bits (R. I. 4853 and R. I. 4800) appears to have great value, according to what should be competent opinion. It may be some time before it will have practical application.

Standards for diamond core-drill fittings have been brought up to date and published recently by Diamond Core Drill Manufacturers Association, New York. See *E&MJ*, Dec., 1952, p. 112.

Other Exploratory Drilling. U. S. Gypsum Co., at Plasterco, Va. has developed a mobile, flexible auger-drilling unit, requiring two men, for determining the character of ground from cuttings brought out of holes 50 to 100 ft. deep by the boring tool. The latter is a string of 6-ft.-long scroll-type augers 1¾ in. in diameter. The assembly was developed by Kennametal, Inc., Latrobe, Pa.

Leo Madson and Paul Brown, Hibbing, Minn. have developed a core barrel and driving device for taking accurate samples in soft or moderately hard Mesabi ores with standard churn-drills.

Blasting Briefs

An Iron Ore Operator, Birmingham, Ala. has standardized on use of a manufactured clay dummy in blasting instead of the dummy formerly used that is made from ore fines at the site. The company is also using rotary drills for making quarry blast holes instead of the conventional jackhammer and drifter. With the larger holes, the labor cost is better and more tons are broken per lb. of explosives.

In the Iron Country, a large company is using Igniter cord in blasting. This burns 16 to 20 ft. per second. With it, only one fuse has to be lit to fire a series of holes. Greater safety and better blast control are obtained.

Tennessee Copper Co. is improving fragmentation by blasting Noranda-type rings in parts, instead of shooting the whole slice in one round. Breakage is better because there is less muck as a cushion. Concussions from large blasts are minimized.

Belleterre Quebec Mines Ltd. is doing all blasting with Igniter cord. Two types are used: the "A", burning at 8.5 sec. per foot for stoping, and the "B," burning at 17 sec. per foot in development rounds. Fuse for any particular job is all of the same length. On the end to be lit is inserted a C. I. L. connector. Some millisecond delay caps have been used on special jobs.

Eagle-Picher, Oklahoma, is using Igniter cord, hot-wire fuse lighter, and smaller powder in some mines.

A Washington Company has had success with Thermalite connectors and cord for spitting fuse-blasted rounds.

Climax Molybdenum Co. has installed DuPont blasting switches along the footwall for electric firing in one area.

A Mid-Western Copper Company is testing Rockmaster milli-second delays in rockburst ground. Electric blasting has helped concentrate the bursts in offshift periods.

International Minerals & Chemical Corp. in its potash mine at Carlsbad, N. M., has improved its blasting by transferring by shuttle car from face to face a lightweight blasting box containing a condenser energized by two drycell batteries. This is better than the former blasting reel.

U. S. Potash Co., Carlsbad, is firing loaded holes with a portable battery - equipped capacitor - type blasting machine instead of carrying power lines and shunt switches forward with each mining advance. Smaller holes and powder are used.

New Senator Rouyn, Quebec, is doing all primary blasting in stopes with milli-second delays. This gives better breakage. Carlon "E" plastic pipe is used for blowing long blast holes out and for tamping explosives.

Powell Rouyn Gold Mines, Quebec, is getting better breakage and fewer misfires with 75% C. I. L. Dygel (a semi-gelatin) and Primacord for grizzley blasting. In stopes where ore width exceeds 10 ft., short period delays are used in stead of tape fuse. This is safer, gives better breakage. A saving in powder of at least 10% has been made by using 70% C. I. L. Driftite for stoping and drifting instead of 40% Forcite.

Length of stope holes has been increased from 8 to 15 ft. Results are: more tons per machine shift, less time spent in scaling and fewer bootlegs per foot of advance in breasting.

A Large Company in British Columbia has made a change in blasting multiple rows or rings in long-hole drilling. Previous practice was to use milli-second-delay caps altogether, which made a complicated hook-up for large blasts. Present practice is to prime with Primacord and use milli-second delays for detonating each ring or part of a ring in proper sequence. The change has resulted in safer and faster loading at no extra cost for explosives.

A Quebec Gold Mine is using milli-second delays in stopes experimentally. It is hoped that better fragmentation and less disturbance of back and walls will improve tramming efficiency, cut scaling time and dilution.

Loading Underground

Machines Popular. Mechanical loading, which removed the back-breaking feature of mucking for labor, continues to ease the difficulties of labor supply for management. A big non-ferrous mining company in Michigan had been using an Eimco 21 loader with a 5-ton car and wanted to use it with its 7½-ton car. To do this it had Eimco build a conveyor for the No. 21 to load onto. With this it is able to load a large car, keep the capital investment down, has a flexible unit, and does the job successfully . . . An underground limestone mine in Pennsylvania, along with a new track-mounted jumbo, has bought an Eimco 40 for drifting . . . Homestake is increasing its use of electric slusher hoists . . . Vulcan Iron Works has introduced a heavy-duty slusher with tandem scrapers. The 150-hp. motor will handle 1000 tph. with 72-in. scrapers

Joy Mfg. Co. has developed a new rock and coal loader, known as the 30BU, to meet the requirements of a heavy-duty rock-loading machine under conditions where its present 18HR-2 loader is a little too large. The new loader, it is said, could be used satisfactorily in driving medium-sized drifts and tunnels and in places where height of back might give the bigger machine a problem. . . . **Pend Oreille Mines & Metals Co.,** Washington, is installing a trackless mining system to meet the chronic labor shortage, as well as rising costs and taxes. It is a copy of that used in the Tri-State.

Last Hobo

The Coy Hobo, developed by H. A. Coy, general superintendent of American Zinc Co. of Tennessee, at Mascot, is drilling 85% more footage than a column-mounted drill in the same stope, according to Mr. Coy. Due to its tire chains it can get into drilling position faster than other stope jumbos in the mine. No more of the Coy machines are to be built, as similar machines can be bought from Joy with wheels set on a wider spacing from the frame to accommodate chains, which will be put on at Mascot.

Trackson Co., now a subsidiary of Caterpillar Tractor Co., has increased the latter's line. Engineering and name changes are planned for the front-end shovel formerly called the HT4 Traxcavator. The new name is Caterpillar HT4 shovel.

The Thew-Lorain (TL-25) scoop shovel, described in *E&MJ*, Sept. 1952, p. 120, is in service in various places as cited in the September issue. National Lead now has three at Baxter Springs, Kans., in addition to the four in Fredericktown, Mo. Eagle-Picher has one in the Tri-State district where it is competing with a Quick-Way dipperstick ⅝-cu. yd. shovel. International Salt Co. has had a TL-25 scoop shovel for some time, and says it is the best tool tried for removing the 50-60-ton fillets of salt left by the Marion shovels at

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Scoop Shovel Proves Useful in Salt Mine in Preparing Face for Undercutting

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A SHOVEL OF THE SCOOP or skimmer type, introduced last year by the Thew Shovel Co., of Lorain, Ohio, as its Model TL-25 Lorain scoop shovel, is being used by the International Salt Co. at its Detroit mine to prepare mine faces for undercutting.

Routine shoveling at this mine is being done by Marion all-electric shovels. The room heights of 23 ft. permit the use of dipper-type shovels up to a 93-M size with a 2¼-cu. yd. dipper, but such dipper shovels leave a salt fillet of about 50 tons at each working face. These fillets comprise the material below the arc of crowd of a dipper. They must be removed to clear the floor for undercutting.

Salt in the fillets ranges in size from dust to chunks 3 ft. long. It weighs about 90 lb. per cu. ft. Hard, compacted masses are often encountered where salt has been squeezed by overlying masses during blasting operations. Furthermore, the faces frequently develop an overhang which increases the difficulties of removing a fillet.

Other Loaders Tried on Fillets

The nuisance with the fillets began about 1940 when jumbo drill rigs were introduced to start single-stage mining, that is, by advances in increments of 10 ft. the full height of 23 ft. Prior to that, the lower 10 ft. of the salt bed was mined first and for considerable distances. Goodman hydraulic shovels were used for that first stage of mining. They very effectively cleaned a room, including preparation of a face for undercutting. The second-stage mining, comprising the upper 13 ft. of the bed, was removed by the Marion shovels but that stage had no undercutting factor.

Subsequent to 1940 and until two years ago, gathering-head loaders were used to remove the fillets. These machines did the work but were costly to operate. Failures were frequent and reconditioning was difficult because the machines are too compact and require too much dismantling to reach defective members. When dependability and costs became intolerable, other machines were tried such as a load-over type of loader on crawlers, a bulldozer on crawlers, and a Hough HDM Payloader on rubber tires. These machines were less successful than the gathering-head loaders, partly because they could not clean the occasional overhang of face and partly because they frequently struck the solid salt of a face and suffered damage as a result. Besides, such machines were not designed for such clean-up work. The Hough Payloader, however, although unsuccessful in face clean-ups, proved to be a very versatile machine otherwise, particularly for pushing up over-shot salt, tractor work such as the hauling of undercutters, the maintenance of roads in the mine, and emergency shoveling at the faces during troubles with the Marion shovels.

Scoop Shovel Is Introduced

Last June (1952) the scoop shovel was introduced for fillet removals or face clean-up work. It has the standard chassis and full-rotating deck of the Lorain dipper shovel used very successfully by hundreds of small contractors, but the typical dipper stick and boom have been displaced by a modification of the skimmer- or scoop-type boom and bucket.

Its Advantages Shown

Advantages of the scoop type for the particular work in the Detroit mine are:

1. It can exert a straight thrust in a salt pile.
2. The bucket sweeps away from pile and not into it after being filled.
3. The swing and sweep of the boom are more powerful than for a dipper type of the same size. This advantage is useful in cleaning at an overhung face.
4. Little hand-shoveling is required to supplement the work of the scoop.
5. The body of the machine can be kept clear of the solid salt to avoid damage to body parts.
6. Stresses are absorbed to a considerable extent by the ropes, instead of by gears, chains, etc.
7. The machine is easy to operate.
8. Maintenance has been surprisingly low in spite of the fact that numerous green operators were used.
9. The scoop takes full advantage of the hard, smooth undercut floor.
10. Accessibility to parts is good, especially without a cab.
11. Travel between working faces is faster than by gathering-head loaders.

Cleans One Face Per Hour

The Thew scoop shovel can load directly into 7-ton utility trucks but a shortage of such trucks in the mine usually compels it to cast the fillet salt into a pile far enough from a face to clear undercutting machines and jumbo-drill rigs. Such piles then await the next cycle of operations, to be loaded by Marion shovels into 20-ton bottom-dump Euclid trucks. The cost is about the same, whichever method of removal is used.

Work done by the scoop shovel averages one face per hour. It has frequently cleaned seven faces in a shift but does not average more than six.

Exhaust Gases Are Scrubbed

Someone may ask what safeguards are used to protect the miners against injurious elements in the diesel exhaust. All such exhausts at the Detroit mine have scrubbers in the discharge ducts. These scrubbers remove aldehydes and oxides of nitrogen but cannot remove the carbon monoxide. Reliance must be placed on good engine maintenance to keep the carbon monoxide content within limits acceptable to the Board of Health of the City of Detroit. Not only have we conformed to CO specifications for mine air but the air anywhere in the mine is clear enough to permit projecting a 1,500-ft. survey sight.

Further Facts

Miscellaneous data regarding the scoop shovel are:

Room width required for 180-deg. rotation of the deck is 25 to 30 ft.

The bucket can be set vertically by cab controls to make use of it as a scraper.

The engine is a 52-hp. Caterpillar diesel.

Overall height of the gantry is 14 ft. 2 in., but this could be lowered to 10 ft.

Boom travel from a retracted position to an extended one is 7 ft.

Size of bucket used in the Detroit mine is 5 ft. long, 4 ft. edge to back, capacity about 0.8 cu. yd. The hard digging occasionally encountered requires a bucket no larger than described. Easier work would permit a larger bucket.

Consumption of diesel "Stanolex" fuel oil per 8-hr. shift is about 6 gal.

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each working face. It has been worked by International in competition with a bulldozer and loading machines of three different makes. This installation in the Detroit salt mine and the work it is doing are described on the opposite page.

Shaft Mucking Tough Job

Mucking, always mean when done by hand, is at its meanest in shaft bottoms. Mechanization of shaft mucking is one of the outstanding achievements in mining. The number of devices for this purpose have multiplied.

For mucking vertical shafts the Riddell shaft mucker continues to hold a substantial lead. It has seen service in practically all important mining districts in the U. S. New Mexico has had 12 installations, Canada 8, Mexico, Europe, Africa and South America 10, collectively.

The Riddell mucker's design has advanced: Circular shafts are now provided with circular trackage, so that the clamshell can reach all parts of the muckpile readily. For extremely wide shafts, a second motion has been incorporated into the carriage, which again allows the clamshell to serve all parts without casting.

Bucyrus Erie's new Hydromucker is said to eliminate most of the hand mucking in shaft sinking. The hydraulically-operated ⅜-yd. clamshell is the main feature. Two men are required, one on the bucket hoist, one on the clam. The hydraulic system is operated by a pump driven by a 15-hp. electric motor.

A hydraulically-operated shaft mucker replaced hand mucking in a shaft of a large company in Manitoba in 1952. It was faster than hand mucking. Excessive water trouble, however, offset the decreased mucking time and left the overall cost of mucking unchanged.

In sinking the 52-deg. inclined shaft of 8x18 ft. cross section at its Sterling mine, N. J. Zinc Co. used a mucking scheme devised at the mine, involving a 13-cu. ft. toothed-lip bucket built on the principle of a dragline bucket with pull and tail ropes. This is dumped into a skip (*MCJ*, Oct. 1952).

Use of two Eimco Rockershovels simultaneously proved to be the key to efficient mucking of U. S. Smelting's 26-deg. Ophir incline, 12x8 ft. in cross section (*E&MJ*, Oct., 1952, p. 72). This permitted both skips to be used. An incentive plan helped.

Interesting sinking jobs have featured potash mining in the Carlsbad area recently. Grouting and freezing were used to get through the water zones. Use of sectionalized concreting forms made of magnesium and plywood was a notable detail in two of the shafts. Grouting has also been an important feature in the sinking of two shafts at Ruth, Nev., by Kennecott.

Mucking with two clamshells operating in the compartments next to the ends in the 38x9-ft. Kelley shaft of the Greater Butte Project provides interesting details. Concreting proceeded upward.

An important Iron Country operator has recently sunk a 265-ft., 8x10-ft. two-compartment timber shaft by drilling a 9-in. hole to depth and enlarging it to 24 in. Enlargement to planned size followed by slabbing downward. This eliminated mucking.

What is called a shaft-sinking record is reported from Orange Free State, where No. 2 shaft (Loraine G.M.) was sunk 370 ft. in 30 days. The shaft has seven compartments, is 46 ft. 4 in. x 10 ft. inside the concrete lining.

Headframe Moved

Minimum operating time was lost in November at N. J. Zinc's new Friedensville mine, in Pennsylvania, when the permanent 200-ton 135-ft. pre-built steel headframe was substituted for the temporary wooden headframe over the shaft. Distance moved was 67 ft., time required 3 hr. 20 min. (*E&MJ*, Dec., 1952, p. 76).

Interest in Diesel Haulage

Number of Diesels Growing. Interest in the application of diesel locomotive haulage underground continues to grow. The number of diesel locomotives in use is still small in the United States and Canada but is rising steadily. That ventilation must be good, that the volume of air introduced must meet a specified minimum, and that exhaust gases must be properly scrubbed are commonly understood. "We are convinced that a diesel locomotive can be operated with safety in the underground operations" is the statement of an operator with experience in handling such locomotives (*E&MJ*, May, 1952, p. 99).

Two symposiums for mining men on underground diesel operation were held in 1952—one in Toronto last May and the other in Denver in September. These indicate the lively interest.

To the diesel-operated units other than locomotives which are found underground, especially in open stopes and approaches, may now be added Joy's 18-25-ton diesel-electric shuttle car. Based on the satisfactory performance of the standard 14-ton diesel-electric car, this larger unit has been designed in accordance with requests for a haulage unit with more capacity and greater speed. Specifications call for speeds up to 17 mph, loaded, on level haulage. If extra grades are met, body capacity is reduced to 18 tons. In doing this a maximum speed of 6½ mph with an 18-ton payload against a maximum grade of 10% is realized.

Diesels In Trackless Mining

At Birmingham, a large operator says that use of diesel shuttle cars indicates better tractive features as well as maneuverability advantages and elimination of cable problems.

Air tramming is still in the picture, as at Howe Sound's Holden mine, in Washington, and Senator Rouyn in Quebec. Hauls should be short. And a third company, in Canada, has recently bought three 45-cu.-ft. and one 58-cu.-ft. air-driven locomotives for development headings. There are others.

Trolley haulage dominates the field, with battery locomotives next. Preferences vary. East Malartic, in Quebec, is "fed up" with the former because ground conditions make it hard to maintain proper head room. But a New York iron mine is converting from batteries to trolley.

Climax Molybdenum now has two new 320-hp. G.E. locomotives. Main features are visibility, dynamic brakes, convenient controls.

A large iron mining company in Birmingham has standardized on bronze welding of main-line track, as compared to conventional fastenings and bonding. Better tracks and track bonding have resulted.

At Howe Sound's Holden mine, in Washington, three methods of ore gathering are standard, depending on conditions in each stope: (1) Slushing with ore passes. (2) Slushing directly into ore cars. (3) Mucking into ore cars.

Clean track is desirable on several counts. At Cleveland-Cliffs Mather "A" Shaft on the Marquette iron range, in Michigan, the Canton track cleaner is being used. Details will be given in an early issue.

Underground communication, especially in respect to haulage is improving steadily. Mine phones installed by U. S. Smelting on main haulage motors in Mascotte Tunnel (Lark), in Utah, are giving satisfactory results.

Conveyors for Transport

Belts vs. Trains. A Mesabi operator has installed a complete conveyor system for an orebody varying in height from 6 to 38 ft., which has been developed. The greatest saving in conveying as compared with train haulage is (1) the time spent in building elaborate slides; (2) the time saved in switching cars from a slide to build up a train load to bring back to the shaft.

A belt conveyor system may also make a mine hoist unnecessary. In figuring on its conveyor-hoisting system, Pend Oreille M. & M. Co., Washington, estimated that construction and operating costs for an inclined shaft and conveyor system would be much lower than for a vertical shaft and hoisting system. Hoisting costs realized are about 6c. per ton and may be 4c. when 2400 tons per day output is reached. The system includes 1500 ft. of 17-deg. incline and 12,000 ft. of 10-deg. incline.

A Hoist at Carlsbad

Semi-to-Fully Automatic. International Minerals & Chemical Corp.'s new high-speed hoist at Carlsbad was semi-automatic when installed, and had acceleration and final stop under operator control. With bigger tonnage demand it was made fully automatic, the load thereby being increased 15% (*E&MJ*, Oct., 1952, p. 77).

New Park Mining Co., Utah, has halved its ore and waste hoisting time with its new 350-hp. Nordberg hoist.

American Smelting and Refining Co. has tried out an improvement in dumping Kimberly-type skips at one of its mines in Mexico. It expects to apply this elsewhere. It will be described in *EM&J*, March, 1953.

M. A. Hanna Co., Michigan, has found the use of radio-telephone type communication from cage to hoistman satisfactory at the one shaft in which it has been installed. The company plans to install similar units in its other operating shafts in the district.

Chief Consolidated Mining Co., Utah, has installed a new double-cylindrical-drum Vulcan-Denver hoist in a winze on the 1800 level, replacing a 125-hp. hoist, maximum depth 1000 ft. Winze is to be deepened from its present 2827 level elevation to 3100 ft. Drums are 84 in. dia. by 60 in. face, spiral machine-grooved, and wind 1¼-in. rope. They have toggle-locking, radial-acting multiple-tooth clutches and post brakes are provided with a dual drive through a single reduction of gears and flexible coupling by two 200-hp., 600-rpm. motors to give 1000 fpm rope speed. Motors and hoist are capable of handling, occasionally, the total load unbalanced on either drum. Total load either drum is 19,300 lb., average differential load 8,500 lb., total load both drums 26,800 lb. All parts of the hoist are sectionalized to pass through a shaft opening of 50x47½ in., with 43 in. between guide faces.

Ground Support

Roof Bolting, or rock bolting or pinning, as a means of supporting ground is being employed extensively, though far from universally. The Bureau of Mines reporetd on Jan. 11 that it is in use by more than 700 large coal, metal and nonmetal mines in the U. S. Replies from operators show that many are giving it a trial but have not definitely adopted it in place of timbering. Where applicable, its advantages are great, as to safety, increased room, decreased resistance to ventilating currents, less dilution, lower maintenance, etc. Bolts, however, are not an answer to all timbering problems.

M. A. Hanna Co., Michigan, continues the use of bolts in binding incompetent layers of shale together. They have been very useful as temporary support in large underground excavations. Steel sets, to be held in place by concrete, are on hand for the new Cannon shaft, which has recently been sunk to ledge by concrete caissons under air.

J. J. Curzon, manager of Howe Sound's Holden mine, says that roof bolting experiments are being continued. The best method found to date for local ground seems to be a combination of roof bolts, interlaced structural steel and chicken wire, all covered with gunite.

The A. S. & R. in Mexico is trying roof bolting in shaft and pump stations. It appears likely to become widespread.

U. S. Smelting, Bayard, N. M., reports that rock bolting with split rod and wedge is being used on an increasing scale as experience increases confidence and judgment as to overall safety and economy.

Sidney Mining Co., Idaho, has tried rock bolting to hold hanging-wall slabs in 70-deg. shrinkage stopes with moderate success. Most trouble comes when the next cut is blasted; rock seems to spall off under the washer plates. Company tried 3x12x12-in. wooden headboards, with a hole bored in the center, under the washers. Results improved except when the blast split the board. Lastly, laminating the headboards was tried by tacking three 1x12x12-in. boards together cross-grained. These boards have been very successful.

An Ontario company is using 1-in.-split wedge type roof bolts in 8-ft. and 5½-ft. lengths in increasing amounts to replace timber sets in development headings, travelways and cut-and-fill stopes, with a resultant saving of 18-20% in cost of material and 20-50% in cost of installation.

Homestake has done some rock bolting for more than 25 years. Commercial rock bolting is now being tried successfully and should effect worthwhile economies.

For ground support, regular timber cribs, posts, sets and battery sets are generally used by **Belleterre Quebec Mines.** In some cases these have been replaced by roof bolts, especially in places where the timber would interfere with ore scraping. Some steel sets are used at the old shaft station.

Better Materials

Pumping. Life of a small mine pump has been increased greatly by Calumet & Hecla by lining it with liquid Neoprene. After 53 weeks of continuous operation its surface was practically unaffected. Salts in the mine water range from 0.3% to 4.5%.

M. A. Hanna Co., Michigan, states that a 6-in. pipe lined with ¼-in. abrasion-resistant rubber has been used for conducting a deslimed glacial gravel crushed to 1-in. Abrasion was severe at wide radius elbows which wore rapidly. These were replaced with unlined air-cushioned elbows. To date, insufficient material has been sent underground to determine life of pipe line.

Island Mountain Mines, British Columbia, is using Carlon "E" plastic pipe for air and water.

Hoisting. Belleterre Quebec mines are hoisting cars, and aluminum alloy cages are used. These cages weigh only half as much as the former steel cars . . . A Michigan mining company has started to build skips out of aluminum.

Haulage. U. S. Smelting, at Bayard, N. M., specified use of abrasion-resistant Jalloy steel in the bodies of new mine cars.

Survey findings on open-cut or surface mining practice will be published in an early issue.

1952 Highlights in Milling

- **Some 65,000 tons of new mill capacity showed a trend in mill designs.**
- **Flotation got a re-examination.**
- **"New" materials fought corrosion.**
- **Research experimented with new tools.**

STARTLING DEVELOPMENTS in milling processes and equipment during 1952 were as rare as Democrats at the inaugural ball, but progress was steady if not spectacular. The general theme of conservatism is demonstrated in three important new mills designed or completed this year; Chuqui in Chile, Barvue in Quebec, and White Pine in Michigan, which makes conservatism ubiquitous, at least in the Western Hemisphere and across a wide range of plant sizes. Flowsheets for all three are relatively clean and simple, and apparently designed with an eye to making future expansion reasonably painless. While each is the result of considerable test work, practical plant designing has not lost sight of the fact that money saved in the routine details of mill operation is just as valuable as money saved by fancy metallurgical practices. For example, in all three cases ease of materials handling has been a major consideration; elevators large enough to hold fair sized trucks, Draco pneumatic conveying systems, wide clear aisles and careful floor planning have been accented. Latest mechanical improvements have been adopted to keep maintenance costs low. These include water lubricated bearings or central lubrication, fluid couplings on the motors which also makes for power saving, and center drive conveyors to keep motors out of the dust at loading or discharge ends of the conveyor.

News of the huge ball mills at White Pine stirred mill men everywhere. The 13x13-ft. monsters are powered by 1500-hp. motors. One mill with Lorain liners and ball charge will weigh about 300 tons, which rules out a traveling crane to pick it up when relining is necessary. The large mills, however, cut down installed cost per horsepower of grinding power expended. The larger the mill, the lower this figure. Using mills requiring only 800-hp. motors would have run capital costs $500,000 beyond cost for the large mills.

White Pine also has an unusual dependency on pumps. At any given time, they will be handling 100,000 gpm.

At Barvue, 8x12-ft. Tricone mills, rated to use 600-hp. with a gear-coupled drive, are using only 400 hp. with fluid drive, in grinding more than 1,000 tons per day. Operators claim that in starting more power is used overcoming the inertia of the motor than in getting the mill up to speed.

Floation

During the year, a lot of mill men took a long hard look at their flotation practices. At several properties, including Utah Copper, Chuquicamata and Ducktown, competitive tests were run between machines of different manufacture. In at least two U. S. mills, metallurgists are hard at work on designing machines tailor made for floating their own ores. In England, the Crigglestone Colliery is using a new cell which features two opposed impellers mounted on a common shaft which runs horizontally at the bottom of the cell. Advantage claimed is that the whole froth surface is unobstructed and can be raked by a long chain which carries runner wipers. Designed for cleaning coal, its flexibility may have application on some ores. In Sweden, they are experimenting with a deep cell. Feed is introduced near the top setting up a counterflow between bubbles and descending particles.

At Kellogg, Idaho, after considerable laboratory work, Sunshine Mining Co. is revising their flotation process to provide a high-grade tetrahedrite concentrate, depressing the low-grade pyrite containing tetrahedrite inclusions, and then floating the pyrite separately. Formerly tetrahedrite and galena were shipped as bulk concentrates but this practice had distinct marketing disadvantages. With the new process, as worked out in the lab, the tetrahedrite - galena concentrate would be conditioned with zinc sulfate and sodium sulfite to float the tetrahedrite and depress galena. No pH control is necessary. (The dichromate method works but doesn't give as good a separation.)

In flotation at least, the gap between pure research on one side and practical mill operation on the other is being closed down somewhat. The argument still goes on as to whether or not the relationship between particle size and flotation rate is more closely defined by a first-order curve or a second-order curve, but the more practical aspect of retention time in flotation has been pushed to the point where it has some meaning for the designer as well as to the mill man seeking to get more capacity or better recovery from his machines. It is understood that studies of retention time such as those made by T. L. Morris at Copperhill are being duplicated at a number of operating plants.

In this respect, too, a practical scientific method of carrying on tests that gives more realistic results with a minimum of testing has been outlined by A. C. Dorenfeld at the annual AIME meeting and in the pages of *E&MJ* (Oct., 1952). Wide response indicates a growing respect for the statistical approach.

A visitor to the U. S., Mr. M. G. Fleming of Great Britain, in an article that did an excellent job of reporting mineral dressing in North America, seemed to feel that not enough attention was given to the scalping of low-grade impure bulk concentrates at a coarse mesh to permit the discard of the bulk of the material at an earlier stage, as is done in Heavy Media Separation. He points out that such a step depends on liberation characteristics of the ore; this approach might be of profit in many plants.

If there's a prize for the greatest quantity and variety of reagents used in a flotation plant, it will probably go to Manganese Inc. in southern Nevada. Reagents used per ton of ore treated in the 1,350-ton mill to be completed this summer, will average 80 lb. soap skimmings, 120 lb. diesel oil, 7 lb. detergents, and 8½ lb. liquid SO_2. All reagents will be emulsified and added to conditioner feed at one time, except the SO_2 added after classification.

It was a banner year for Heavy

Media Separation, with 160 installations. Most of the new units are handling metallic ores and the majority of these are the drum-type separator. Plants installed in the nonmetallics field continued to stick to the cone which gives better results where the density difference between sink and float is slight.

In February, ore dressers were offered a third theory of comminution by F. C. Bond; that work involved is inversely proportional to the square root of the product diameter. It has acquired the support of some able men in the milling field. One well known consultant goes so far as to say that this is the "only way" to determine size and horsepower of a mill. Others contend that Mr. Bond has presented an improved method of correlating data, but insist that it does not get at the fundamentals of the energies involved in comminution.

In grinding, the argument still flourishes on the resolution that there is no such thing as overgrinding in the sense that the particles are ground too fine. Both sides (or are there three sides?) claim that they are amassing conclusive arguments. Perhaps technical meetings in 1953 will bring them forth.

In the field, rod mills continue to gain ascendancy over rolls with at least four such replacements noted. Although several are still under trial, impact crushers have not proved completely successful in handling very hard rock. Excessive wear and maintenance overcome the advantage of high capacity that several types offer.

Pebble Milling

Up north, four or five Canadian mines are seriously considering a switch to pebble milling, following the continued success of B. S. Crocker's spadework at Lake Shore. Wright-Hargreaves, a Lake Shore neighbor, has converted to pebbles and, according to Mill Superintendent Black, the money saved in the first 12 to 14 months of operation, paid for the conversion. Observers agree on the benefits of pebble milling where surplus mill capacity is already available, but wonder whether it is worth while to add the necessary mills that lower capacity pebble milling would require. Crocker, who has achieved the status of consultant on the subject, admits that each mill has its own special conditions to deal with, but feels that a great many plants would profit by conversion to pebble milling despite high original capital outlay for the plant alterations.

Dry grinding seems to have gotten a foot in the door of the asbestos business, where for years, fiber has been literally shaken loose from the rock. Asbestos Corp. tried out the Aerofall mill for a year at the Beaver mine and liked what they saw well enough to consider six more for the new Normandy property. (The Aerofall unit is an airswept mill with a short length with a very large diameter. It is used with or without a charge of balls.) Another company is giving serious thought to a more conventional mill for freeing fibers. Chief advantage of grinding over shaking is a better recovery of premium grade long fibers.

More people are trying more things with cyclones, but the most important uses still seem to be as classifiers for regrinding, and to thicken tailings for mine backfill. One mill man is experimenting with a cylindrical cyclone with slotted side to control separation. After all, as long as you get the desired vortex action, the vessel does not have to have a cone shape.

Instrumentation

Instruments are gradually replacing the operator's educated guess as a guide for running the mill but the path to push-button control is strewn with abandoned instruments rather than roses. While some instrument applications are cut and dried, others run up against problems peculiar to ore dressing processes. Practically all new mills have automatic feed control and sampling. Temperature, pH, and electrical conductivity (as in the Copperhill flotation cells which handle soluble salts) are not an instrument problem. On the other hand, density control has proved difficult in many plants. At International Mineral and Chemical's Noralyn plant, it took many months of patient trial and error to get density control units to operate correctly. W. O. McClintoock, flotation superintendent, summed up the experience with a statement that the location of the sensing device has to be determined with extreme care to discover a point in the unit where the density is critical and changes are fairly gradual so that the controller is not constantly hunting. A specific point in the underflow proved to be the spot for best control on Noralyn bowl classifiers and some hydroseparators. Noralyn also uses a hydraulic rake lifter on its huge hydroseparators to raise and lower the rake as the kilowatt load on the drive motors fluctuates.

Maintenance

More U. S. mills were turning to Linatex, a patented form of Latex rubber, for increasing the life of pump impellers, end bells, shells, conveyor belts and other parts subject to corrosion or abrasion by ore or concentrates. Canadians are old hands at the use of Linatex and its use is almost universal in Canadian plants. An American mill which recently began lining pumps with Linatex, said that not only was 50 to 100% more service obtained from the newly lined shell, but the cost was one-sixth that of replacement with a new pump. Latex can be cold worked. When bonded with a special cement, the strength of the bond is equal to the body of the latex for all practical purposes.

Other measures that got a lot of attention as ways and means to cut down costs due to corrosion and wear, included porcelain lined fittings and metal spraying. Consolidated Mining and Smelting Co. reports excellent results spraying worn parts with a metal selected for the given service of the part. A pump sleeve for example, is sprayed with stainless steel, and machined down to proper tolerances.

Mill men who have tried it, have nice things to say about machine welding, particularly in hard surfacing. At the Federal mill in southeast Missouri, for instance, hard surfacing of rolls by machine does a good job for 50 to 80 days. Hard surfacing by hand offered only 30 days. Not only is machine work quicker, it conserves metal and gives a uniform layer of metal for better service. Federal may soon start hard-surfacing crusher mantles by machine.

Another development worth keeping in mind, is the use of plastic laminate bearings on ball mills. One manufacturer is trying them and claims they are improving the performance of his mill.

Research

Restless research men continued to feel out the possibilities of radioactivity as a tool in mineral dressing research and even production. At the London Symposium, Carr presented a summary of work in application of radioactivity to flotation research with a list of radioactive compounds available. Earlier at the AIME annual meeting, Gaudin, Spedden and Kaufman discussed radioactive tracers in comminution. The authors used tracers to follow

the rupture of a particular particle in relation to environment of other pieces, carrying the study of size distribution beyond cold statistics. Their suggestions for further study include comparison between crushers, pulp density, speed of mill, and preferential grinding of a given mineral.

In an article in *E&MJ* (Nov., 1952) Gaudin, Senftle and Freyberger suggest bombardment of minerals with neutrons to induce radioactivity. Since radiation is emitted at different rates from different minerals, a separation might be made on that basis with a device similar to one in use at Port Hope, Canada, which picks uranium bearing particles from a stream of particles on the basis of natural radioactivity. Chief drawback to the plan is finding a reasonably inexpensive way to bombard minerals with neutrons.

Supersonics is another relatively new tool that interests mineral dressing researchers. Its use in dust collecting is pretty well known, and some time ago Dr. Shiou-Chuan Sun demonstrated its effectiveness in destroying a froth and keeping surfaces free of froth. More recently in Japan, flotation experiments showed an 89.9% recovery of chalcopyrite using ultrasonic waves, as compared with 15 minutes in the case of conventional frothers. With galena, 100% recovery was obtained in 10 minutes compared with 62.8% recovery by normal methods.

What may prove to be one of the most important developments of 1952, was International Minerals & Chemical Corp.'s announcement of the LeBaron-Lawver dry beneficiation process for potash, phosphate and other ores. Scanty information released to date indicates that the process is fundamentally an electrostatic separation, preceded by some conditioning of the ground ore. A full-scale potash plant is planned for the Carlsbad area.

Manganese

(*Continued from page 99*)

tons, about 95% coming from Montana. Shipments of ferruginous and manganiferous ores were approximately 1,000,000 short tons, over 90% coming from Minnesota.

The steel strike coupled with the sharp increase in volume of ore imports made possible a rapid recovery of industry stocks. Government allocation was eased in midyear to permit delivery and acceptance of foreign ores to ferroalloy producers without formal allocation authority.

The production of domestic ores was stimulated by government programs. A program was put into effect in July 1952, under which ore meeting stockpile specifications was accepted at any United States point without further freight charge to the producer. This was supplementary to a purchase program for ores of lower grades which were accepted only at purchase depots established at Deming, N. M., Butte and Philipsburg, Mont., and Wendon, Ariz. The quantity of such material produced was relatively small. Offerings of domestic ore were expected to increase when sufficient time elapsed for domestic sources to get into production.

Big Rise in Imports

Imports of manganese ore showed a substantial increase over 1951 and by the end of September 1952 had already exceeded those for all of 1951. Indications were that the total receipts of ore for 1952 would be an estimated 2.4-million short tons, considerably more than in any other previous year.

Manganese Statistics

Short Tons [1]

	1951	1952 [2]
Domestic Production	94,793	110,000
Domestic Consumption	1,882,997	1,650,000
Exports	8,029	8,500
Imports	1,768,773	2,400,000

[1] Includes all ore 35% or more Mn. [2] Estimated.

Of the total imports 38% originated in India, 17 in Gold Coast, 11 in Union of South Africa, 10 in Cuba, 7 in Brazil, 5 in Mexico, and the remaining 12 in French Morocco, Portuguese India, Angola, Turkey, Chile and other areas. The heavy increase in imports can be traced to the changes from 1951 in the volume of ore supplied from the six largest foreign sources. Imports from India increased an estimated 60% over 1951, those from Gold Coast and three-fourths from Brazil 95, from Mexico 32, while imports from Union of South Africa fell 20%.Over half of the imported ore came from India and Gold Coast and three-fourths from these two countries and Union of South Africa and Cuba.

In general, prices of imported ore remained stable at $1.20 to $1.25 per long ton unit, 48% Mn, c.i.f. U. S. ports, duty extra with long-term contracts nominally $0.90 to $0.95 on the same basis. Anaconda Copper Mining Co. raised the prices of modulized manganese ore about 25% in the latter part of the year.

Producers of ferromanganese received a measure of price relief from OPS in August to cover increased production costs, when the prices of manganese alloys were raised on a basis of approximately $40 per ton, standard-grade ferromanganese. Alloy producers did not find complete easing of their difficulties, however, as the grades of ore in stock had deteriorated due to attrition in 1950 and 1951 and the replacement ores imported during 1952 were somewhat lower in grade. As a result, the average grade available for making ferro was much lower than in 1951, and the industry was forced to lower the grade of standard ferro from 78-82% to 72-76% Mn. However, the historical price schedule, based on ferromanganese of 78 to 82% Mn, was not changed along with the grade of the alloy, so that penalties still prevailed for the lower-grades of ferro.

Strike Cuts Ore Used

Although the rate of manganese alloy production and consequently manganese ore consumption exceeded that of 1951 for several months of 1952, the steel strikes sharply reduced operations from April through August so that total ore consumption for the year was only an estimated 1.65-million short tons and production of ferromanganese and other manganese alloys fell to an estimated 770,000 tons. Imports of ferromanganese dropped to about 58,000 short tons.

Year-end stocks of ore had increased to over 1-million short tons while the stock of manganese ferroalloys increased to about 170,000 short tons, a better stock of materials than at any time in the past three years.

These quotes will give you an idea of why we think you'll find this article interesting.

ON TACONITE:

"Within the next 10 years 10-million annual tons of taconite concentrates will be rolling off the production lines."

ON MAGNETIC ROASTING:

"The roasting procedure potentially offers the not inconsiderable advantage of higher recoveries from these troublesome materials (non-magnetic taconite)."

ON CYCLONE CONCENTRATION:

"By the 1953 season . . . there will be a total of six heavy-density cyclone plants in operation on the Mesabi Range, with an overall rated tonnage of about 735 tph of new feed."

ON CYCLONE CLASSIFICATION:

"The operators report that substitution of cyclones for conventional classifiers has resulted in a net saving of power in the grinding circuit with very much increased flexibility of operation."

ON SCREENS:

"Indications are that screening may go part way in answering the problem of removing excess water from HMS feed."

New Devices, New Flowsheets Liven Iron Ore Processing

New developments in use of cyclones, HMS units, magnetic separators, spirals, classifiers, mark year in iron ore industry. Expanded programs seen for year ahead.

LESLIE J. BECHAUD, JR.
Newmont Mining Co.
Grass Valley, Calif.[1]

TACONITE CONTINUED to hold the focus of public interest on iron ore beneficiation in the year immediately past. Serious attempts have been made to estimate the probable production of concentrates from Lake Superior taconites within a time span of the next decade, and to relate this production to total iron ore requirements. Such estimates have indicated that by the year 1960, 6% to 12% of our total iron ore supply will be in the form of taconite concentrate. It now seems reasonably certain, based on the announced plans of Erie, Reserve, Oliver, and Cleveland-Cliffs, that within the next ten years 10-million annual tons of taconite concentrate will be rolling off the production lines.

The year 1952 has witnessed many developments toward the realization of commercial taconite: operations have been started at the Babbitt plant of the Reserve Mining Company, which is the forerunner of a much larger commercial plant to be built at Beaver Bay on the shores of Lake Superior, where construction of harbor facilities, railroad, and plant site is already under way; the Oliver Iron Mining division of U. S. Steel started construction of a 6000 tpd (crude) magnetic taconite plant at Virginia, with the first production scheduled for 1953; Cleveland-Cliffs and Ford Motor Co. began work on the first unit of a 400,000 annual ton flotation plant at their Humboldt property in Michigan; and Erie has announced plans for a commercial magnetic taconite plant patterned on their experimental work at Aurora.

The M. A. Hanna Co. discontinued work and dismantled the 250 tpd spiral-flotation pilot plant at their Groveland property on the Menominee Range. Operating data collected have fully verified expectations of a commercial process. Further plans have not been announced.

Progress may have been curtailed on some fronts this past year due to the industry-wide steel strike which accounted for a loss of 60 days or about 30% of a normal operating season. The push for tonnage to make up lost time took precedence. Prior to the strike the goal for Lake Superior iron ore production for the 1952 season amounted to 96-million gross tons. Actually, about 80% of this goal was realized, which ought to keep the blast furnaces in operation until the opening of the 1953 season.

Armour and Co. announced activation of their fellowship at the University of Minnesota. This is a three-year program devoted to basic research in the field of iron ore flotation, with the initial work being undertaken in the study of cationic-type reagents. Anionics may come in for scrutiny at a later date.

The general problem of slime coating is necessarily concomitant with this field of research, and it is interesting to note that slime coating in floating oxide ores in general is being studied at the University of Alabama. Adrian Dorenfeld, professor at the U. of Alabama, has published a paper on the application of Factorial Design to mineral engineering (*E&MJ*, November, 1952, p. 78), which presents a new tool for the evaluation of results of testing.

Corn Products Refining Co. also has a fellowship at the University of Minnesota where the effects of various starch products on hematite and quartz are being studied in regard to their separation by flotation. A paper by N. M. Levine in the April *Mining Engineering* pointed up the special difficulties

[1] Mr. Bechaud, at the time of writing this article, was in the employ of the M. A. Hanna Co., Hibbing, Minn.

encountered in beneficiating the non-magnetic taconites of the Gogebic Range.

Magnetic roasting for processing lean ores was highlighted in a paper by Fred DeVaney presented at the New York AIME meeting in February. The process developed by Erie in pilot plant form is novel in that it makes use of very low concentration of reductants in the carrier gas. A concentration of 6% CO was reported to give good conversion of hematite. Good heat economy is also claimed for this process.

Magnetic Roasting

Magnetic roasting is coming in for close scrutiny by most of the major producers in the iron ore industry as a possible means for treating lean ores and nonmagnetic taconites. Magnetic concentration is simple and effective, and the roasting procedure potentially offers the not-inconsiderable advantage of higher recoveries from these troublesome materials.

An extra dividend is the increased ease of grindability of heat treated materials, as pointed out by Will Mitchell, Jr. *et al.*, in a paper "Factors in Economics of Heat Treated Taconites" (*Min. Eng.*, Oct., 1952). These investigators, working with Erie taconite, determined the power required for grinding after heating to 1,800 deg. F. in both oxidizing and reducing atmospheres. With water quenched and air cooled roasted ore, power requirement was 55% and 65% respectively of that for unroasted material. The power saving will undoubtedly vary with different materials. It does not seem unreasonable to expect as much as 50% reduction in grinding energy in some cases.

Low cost fuel in the form of natural gas on the Mesabi would undoubtedly stimulate the interest in magnetic roasting still further. The very nature of the process bids fair to surmount one of the big obstacles that flotation has encountered in the treatment of low grade ores in Minnesota. That is, there is potentially greater assurance that variability in character of feed will not upset the apple cart in a magnetic roasting plant to anywhere near the extent that it would in a flotation plant, at least in its present state of development.

Improvements in equipment to some extent have taken the form of adding extra weight and strength to standard models. Nordberg has increased the weight of the 7-ft. Symons cone crusher by about 30% expressly for taconite duty. The 60-in. Allis-Chalmers gyratory for Reserve's Lakeshore project reportedly will be the world's largest crusher and will weigh in excess of 1.2-million lb.

New ideas in crushing and screening were under test on the Mesabi last year. Rubber-surfaced screen cloth was one innovation under trial. At the Mary Ellen mine of the Stanley Mining Co., Biwabik, a 7-ft. diameter Weinig concentrator was put into operation. This took the place of the 48 in. unit under test in 1951.

Also in the works was a program by Erie to investigate the effect of super-high (80% critical) rod mill speed using a 9½x12-ft. rod mill. This should help to settle the controversy over whether the benefits obtained at Consolidated in their 11½-ft. diameter mill can be realized with other materials under different service conditions.

HMS on Increase

Applications of Heavy-Media Separation continue to increase in the Lake Superior and Alabama regions. Five new plants went into operation in the Lake district in 1952 with six more under construction for the 1953 season. This represents nearly a 100% increase in the number of plants using Heavy-Media over the year 1951.

From Alabama comes news that the Woodward Iron Co., Birmingham, has a 300 tph HMS concentrator under construction. This plant is for the purpose of rejecting contaminants incurred in mining; the major gangue constituent of the ore is not liberated at the treatment size used. It is reported that single stage mining of the seam can now be used instead of the three-stage operation employed formerly to hold silica contamination to a minimum.

In the Russellville, Alabama, area four concentrators are now in operation on the brown iron ores of that district and one Heavy-Density plant is in use in the east Alabama-Cedartown, Ga., area. In the latter area log-washing and hand-picking accounts for the majority of production.

In the Lake Superior district, a separatory vessel new to the iron ore industry will be introduced when the Skubic Bros. heavy-density plant at Virginia, now under construction, goes into operation in 1953. This plant will employ a Roller separator furnished by Wilmot-Daniels Co. The separator circulate medium through an external agency to maintain medium suspension, and removes sink by means of a drag-flight conveyor. There are no internal moving parts other than the flight conveyor.

Counting noses of all the heavy-density vessels (excluding cyclones), now in use and building in this country and Canada for the iron ore industry in the 1953 season reveals that out of a total of 34 HMS plants, drum-type separators outnumber all others combined by a ratio of about 2:1. Based on rated plant capacity, the tonnage treated by Heavy-Media Separation in the Lake Superior district stacks up as indicated in the following table. This district alone contains 65% of the HMS plants in the iron ore industry.

HMS Plants
Lake Superior District

	Rated Annual Product	
	TPH	Tons
1951	2700	5,000,000
1952	3600	6,700,000
1953	4700	8,700,000

The Coons-Pacific plant at Virginia on the Mesabi is typical of the integrated units now being built by some producers in the Lake Superior district for beneficiation of the more refractory HMS ores. WKE-designed and placed in operation in 1952, this plant incorporates flexibility to permit effective treatment of ores of different character lying within the economic hauling radius of the plant.

The flowscheme includes crushing, conventional Heavy-Media Separation of the plus ⅜-in. fraction, treatment of the classifier sand product by means of jigs, and spiral concentration of the classified overflow. Conveyoflo meters, a new introduction on the range this past season, keep a continuous record of the amount of crude ore entering and the coarse tailing leaving the plant.

The "fines problem" on the Mesabi continues to be of importance to producers as the supply of wash ore diminishes and the demand for tonnage remains strong. The methods most in favor for treatment of classifier products include jigging, heavy-density cyclone treatment, and spiral concentration. Judging by the number of cyclone plants under construction for 1953, this method has caught

the fancy of a number of metallurgists as a possible solution to a troublesome problem. The high capital cost of such plants, however, will probably militate against the use of this process for any but the larger operators.

Cyclones Gain Favor

In 1951, the first commercial heavy-density cyclone plant in the Lake Superior district was placed in operation at the Buckeye mine of the Hanna Ore Mining Co. In 1952, a cyclone pilot plant was also in operation at the Holman concentrator of Cleveland-Cliffs Iron Co. By the 1953 season, if present construction plans are carried to completion, there will be a total of six heavy-density cyclone plants in operation on the Mesabi Range with an overall rated tonnage of about 735 tph new feed.

Medium recovery and cleaning is a real problem not fully solved at the present time. With a ratio of two parts magnetite medium in circulation to one part new feed, a 150 tph cyclone plant must be capable of treating between 7,000 and 7,500 tons per day of medium. Since the cyclone is in reality the smallest part of the plant, this truly becomes a case of the tail wagging the dog.

There seems to be some tendency on the part of operators to load the magnetic separators in the cleaning circuits to a capacity of 15 to 20 tons per hour per foot of magnet width. There is a feeling in some circles that 10 tph should be absolute tops to satisfy both recovery and cleaning. So far as can be seen now, it is believed that it may be possible to hold magnetite losses to about 5 lb. per ton under good operating conditions. If so, medium losses will compare favorably costwise with those obtained in ferrosilicon plants. This figure has yet to be realized.

One of the interesting cyclone plants in operation for 1953 will be at the Harrison plant of Butler Bros. The flowscheme will utilize three 12-in. cyclones for Heavy-Media Separation and 60x36-in. drum-type separators in the primary medium cleaning circuit with 60x24-in. Alnico permanent-type drum separators for secondaries. Abrasion milling, standard practice at the Harrison for the past several years, will be retained for alternate parallel and series operation with the cyclones. Present thinking is to use concurrent boxes on the primary magnetic separators and counterflow boxes on the secondaries. Abrasion milling is expected to give additional liberation before cyclone treatment.

At Cleveland-Cliffs' Hawkins mine at Nashwauk, a Heavy-Media unit employing an 84-in. Akins separator was placed in operation in September. Another unit is now under construction using a 7x16-ft. Hardinge separator. In this second unit, one Dings 36-in. oil-cooled high-intensity belt-type separator will take the place of the usual two 36-in. machines normally used in primary medium cleaning circuits. A two-unit cyclone plant is also under construction for 1953. This plant will treat the usual classifier product. The same company is installing a second two-unit cyclone plant at their Hill-Trumbull mine at Marble. The sixth cyclone plant on the Mesabi Range for 1953 operation will be at the Hill-Annex property of the Jones and Laughlin Steel Corp. at Calumet.

Magnetic Separators

The past year has done little to coalesce opinion on proper application of magnetic separators in Heavy-Media circuits. Proponents of counterflow and concurrent boxes, drum, and belt type separators still hold forth with their respective views. The Dings high-intensity belt type separator, with a field strength of 2800 gauss, is expected to have twice the capacity and carry twice the magnetic load of the standard 36-in. machine. A unit of this type has been under test at Butler Bros.' Harrison plant for the last two years.

Permanent Alnico-type separators are also making their appearance. At the Erie taconite plant at Aurora, and the Reserve preliminary plant at Babbitt, Alnico separators (Dings and Jeffrey) are under trial. The permanent-type magnetic separators will be incorporated in several Heavy-Media circuits for the 1953 season.

From time to time, various devices have been proposed for automatically recording tailing losses in magnetic separator circuits. Dings expects to have such a device on the market soon. An intermittently energized electro-magnet will be placed in the pulp stream. The rate of increase of magnetics between the poles will govern the current flowing in an ac circuit which will be translated to magnetic loss by an indicating or recording instrument.

Cyclone classification in a 24-in. Dorrclone was described by W. R. Van Slyke in a paper presented in January at the annual University of Minnesota symposium in Duluth. Installed in the Canisteo washing plant of the Cleveland-Cliffs Iron Company at Coleraine, this unit treated 1,300 gpm of classifier overflow at 17% to 26% solids and 15 to 18 psi feed pressure. Purpose of the installation was to demonstrate the feasibility of desliming a classifier overflow variable in respect to percent solids and structure, preparatory to treatment of the thickened and deslimed solids by conventional fines treatment. As a result of this work, a full scale plant is scheduled to be built for late 1953 operation.

Erie has also investigated the use of cyclones for classification at their Aurora taconite pilot plant. Six 10-in. cyclones are installed in closed circuit with a 10x12-ft. ball mill taking 80 tph new feed containing approximately 52% Fe. Classification is varied between 60% and 80% minus 325 mesh in the cyclone overflow depending upon character of feed. Primary control to set the classification range is percent solids in the cyclone feed slurry.

The operators report that substitution of cyclones for conventional classifiers has resulted in a net saving of power in the grinding circuit with very much increased flexibility of operation. Power saving, of course, is due to increased classification efficiency by the cyclone.

The work by D. A. Dahlstrom (*Min. Eng.*, Aug., 1952) on the use of hydraulic water in the liquid-solid cyclone suggests the possibility of increasing classification efficiency still further. Hydraulic water additions may also be important to those investigators working on preparation of a suitable feed for flotation.

Classifiers For Taconite

As indicated by the foregoing, the taconite industry is well aware that there is much to be gained by improving classification efficiencies in grinding circuits. Another move in this direction was highlighted by the presentation of a most excellent paper at the fall AIME regional meeting in Chicago. Messrs. E. B. Johnson and R. R. Smith, working for the Cleveland-Cliffs Iron Co., reviewed their findings in their pilot plant investigation on the application of the Dorrco Hydroscillator in closed circuit grinding of Michigan lean ores.

Conclusions reached, among others, were that the Hydroscillator sand return contained less slime and

fines, that there was a greater elimination of critical sizes, and that capacity was roughly 1¾ times that of conventional mechanical classifiers per unit of floor space. The results were sufficiently encouraging that a 14-ft. diameter Hydroscillator will be installed in the grinding circuit at the Humboldt mine, the joint Cliffs-Ford venture. (See p. 128, this issue.)

Spiral Use Grows

Concentration of classifier overflows by means of Humphreys spirals is becoming standard procedure in many Heavy-Media and washing plants on the Mesabi Range. The Patrick fines plant of Butler Bros. at Cooley, with two full seasons of operation to its credit, reports exceedingly light wear on standard cast iron spiral sections. Comparative performance of cast iron and Ni-Hard, installed for test purposes, cannot be made at this time because of the light wear on the standard sections. Other operators have replaced rapidly wearing cast iron spirals with Ni-Hard sections and report up to the present time fairly light wear characteristics. However, several seasons additional operation will be required for complete evaluation. (See also use of Neoprene on spirals, *E&MJ*, Jan., 1953, p. 102.)

A fines plant to treat the accumulated Hawkins tailings pond material was placed in operation by Cleveland-Cliffs late in 1952. The feed to the plant is first deslimed in a 30 ft. diameter hydroseparator with the underflow being treated in four Dorrco sizers. Concentrate is removed from some of the sizer pockets, and the waste pockets are then treated in one or two stages of Humphreys spirals, depending upon the nature of the material being delivered to the plant. The operators claim a high degree of flexibility for this combination of sizers and spirals.

A new producer being opened up on the west end of the Mesabi between Coleraine and Grand Rapids is the West Hill property of the Western Mining Co. (Pickands Mather, operators). A 700 tph washing and screening plant, and a 250 tph Heavy-Media plant are now under construction. Operation is scheduled for 1953. An interesting feature of the plant is that double-decked troughing type screens will be used in the medium recovery circuit. This is the first application of this type of screen in HMS circuits and performance will be watched very closely by industry members.

Stainless steel screens of the wedge-wire and wedge-slot type are finding favor with operators for duty in Heavy-Media circuits. Increased life and freedom from blinding are the advantages. Cleveland-Cliffs had under investigation a 6x16-ft. Robins "Dewaterizer" screen to remove free water from classified sands preceeding cyclone treatment. Indications are that screening may go part way in answering the problem of removing excess water from HMS feed. In the only other cyclone plant in operation on the range last year, a drainage belt of the chevron type was used for free water removal.

The Groveland Plant

As previously noted in this review, the M. A. Hanna Co. had in operation a 10 tph pilot plant at their Groveland mine on the eastern end of the Menominee Range in Michigan. The property is a low grade (33% Fe) "jasper" typical of that part of the range, and requiring moderately fine grinding for liberation of contained magnetite and specular hematite. The plant was operated continuously during the winter months with no insurmountable problems arising from freezing conditions.

Recovery was effected by a combination of Humphreys spirals and flotation. Hum-mer and Ty-rock repulping type screens were found effective in controlling the primary grind at 28 mesh. The flotation circuit, operating on reground (65 mesh) spiral tailing, employed the American Cyanamid procedure of floating the iron away from the silica. Double cleaning was necessary to maintain grade of product.

Standard Fagergren and Galigher "Agitair" cells were used in the roughing and cleaning circuits. Filtration of the flotation concentrate, in spite of the absence of slime particles, is complicated by the presence of oily flotation reagents. A mono-filament Saran cloth was found to give the most satisfactory performance on the 4x2-ft. Eimco drum filter.

The problems encountered in treating the Michigan "jaspers" are quite distinct and different from those found in magnetic taconite plants, and this carries through to the final agglomeration step. Best opinion at the present time is that it will require approximately twice as much external fuel to bake hematite pellets properly as is required for magnetite. Problems in actual ball formation are also somewhat more severe for hematite, particularly in the case of flotation concentrates lacking natural slimes and containing oily reagents.

The Iron Curtain having been rung down pretty solidly on the two existing operating magnetic taconite plants in Minnesota, not much reliable information is available on this end. It is known that Erie plans to have in operation by the end of 1952 a 6x14-ft. rectangular shaft-type furnace. It is believed that feed distribution problems will be less pronounced than with the original furnace of circular section. Tacobond, a grain sorghum marketed by Archer-Daniels-Midland Co. has made its appearance and is quite effective in promoting green strength in pellets.

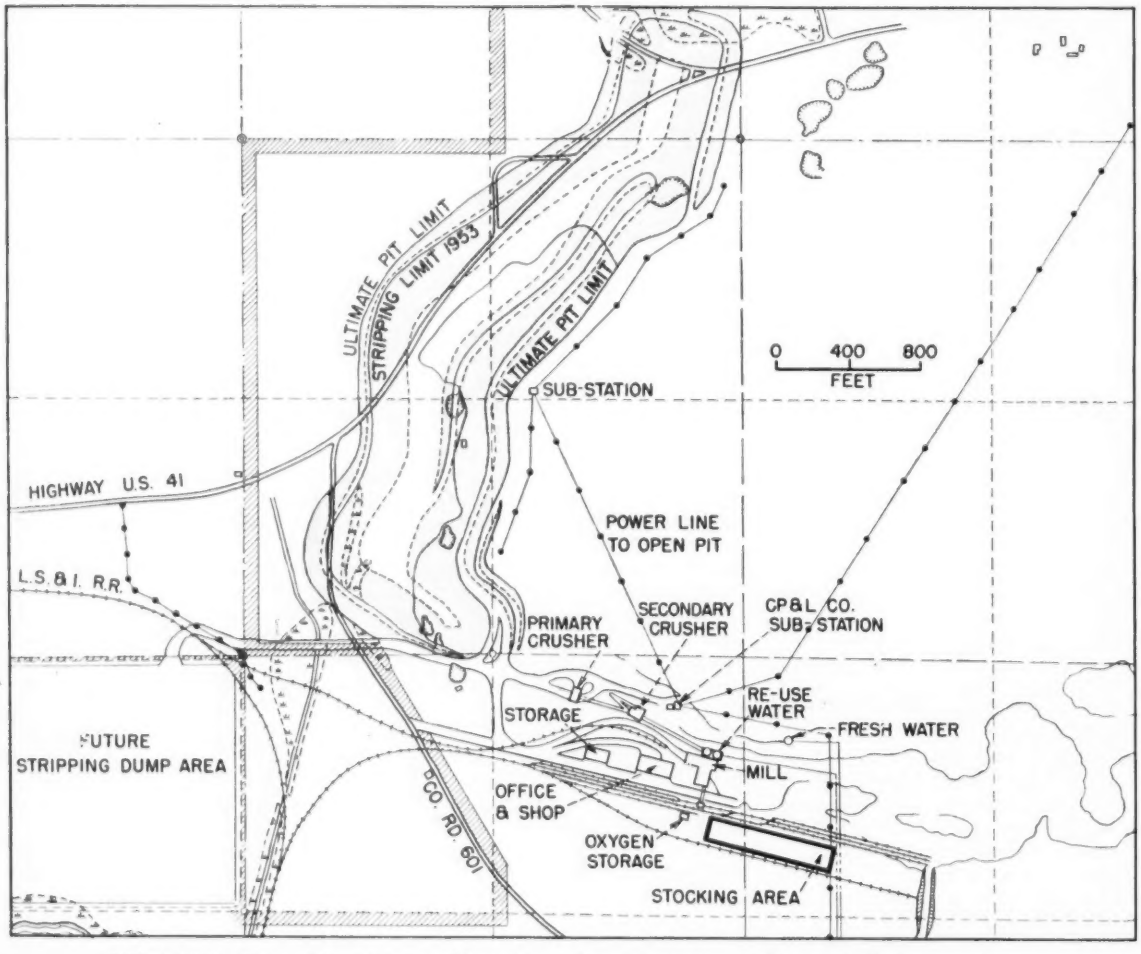
A paper by T. E. Ban and L. J. Erck, presented at the Chicago AIME meeting in September, gave procedures and results obtained in the Cleveland-Cliffs laboratory on the determination of pelletizing characteristics of iron ore concentrates. A recent paper by S. R. B. Cooke and T. E. Ban (*Min. Eng.*, Nov., 1952) is helpful in promoting the understanding of the physico-chemical changes occurring during the firing of pelletized magnetite. Allis-Chalmers has its continuous-grate pilot plant going at Carrollville in Wisconsin. The full heat recuperative system, one of the most interesting features of the traveling grate process, has not yet been installed.

New Sinter Machine

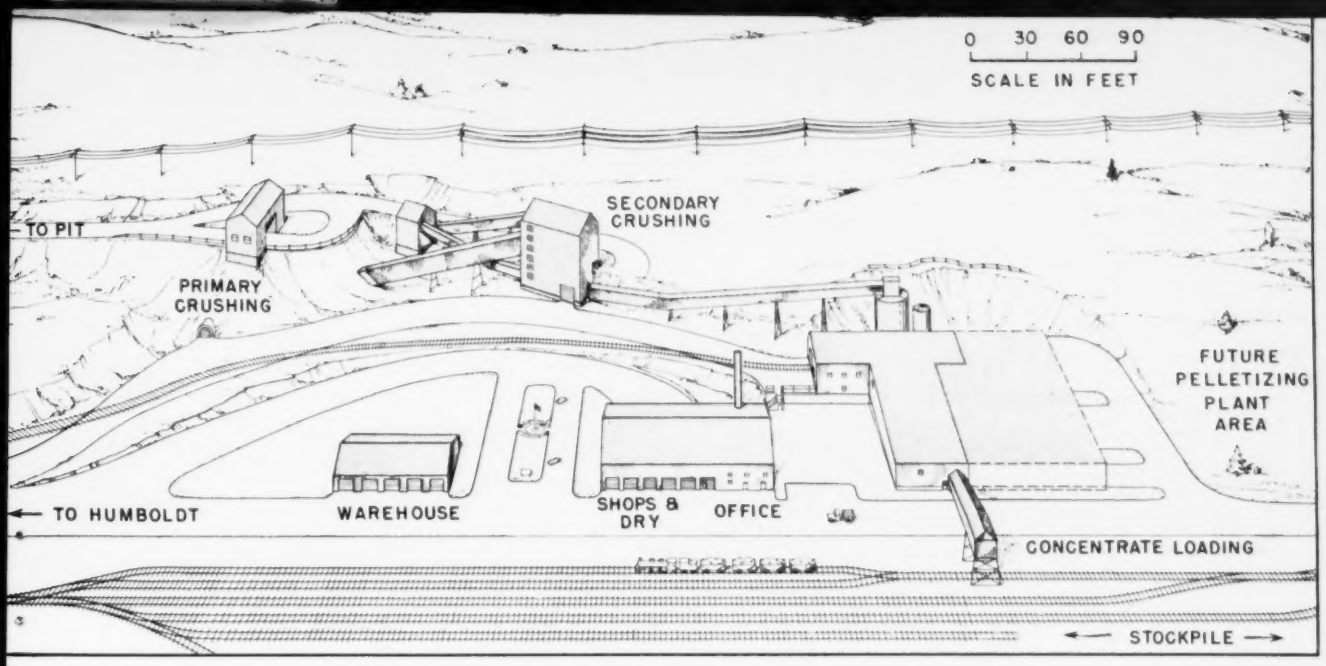
Jones and Laughlin Steel Corp., at Benson Mines in New York, placed in operation in 1952 the first full-scale gravity concentration section for treatment of non-magnetic ores present in the orebody. The process involved includes rod mill grinding to 14 mesh in closed circuit with screens, followed by three stages of concentration in Humphreys spirals. An interesting feature of the circuit is that the fine portion of spiral tailing is treated magnetically to recover fine magnetite values lost by the spirals. A yield of 300,000 annual tons of 61% Fe product is expected when treating ore at a rate of 115 tph with a ratio of concentration of 3 to 1. Metallurgical recovery in the range of 82 to 85% is reported. Sinter capacity was also expanded by 50% at Benson in 1952 with the addition of a new sinter machine 2 meters wide and 147 ft. long. The last 35 ft. of the machine is used for air cooling.

HUMBOLDT FLOTATION PLANT and other buildings are being erected on this site. Compare with drawings.

Project will be Michigan's first commercial development of jasper formation.



OPEN PIT will be adjacent to crushing plant and concentrator. Ultimate pit limits are shown.



THIS SKETCH suggests how the buildings of the Humboldt plant will appear in relation to each other.

SPECIAL FEATURE

Humboldt Iron Will Be Recovered by Flotation

D. K. CAMPBELL
Project Engineer
L. J. ERCK
Chief Metallurgist
Cleveland-Cliffs Iron Co.
Ishpeming, Mich.

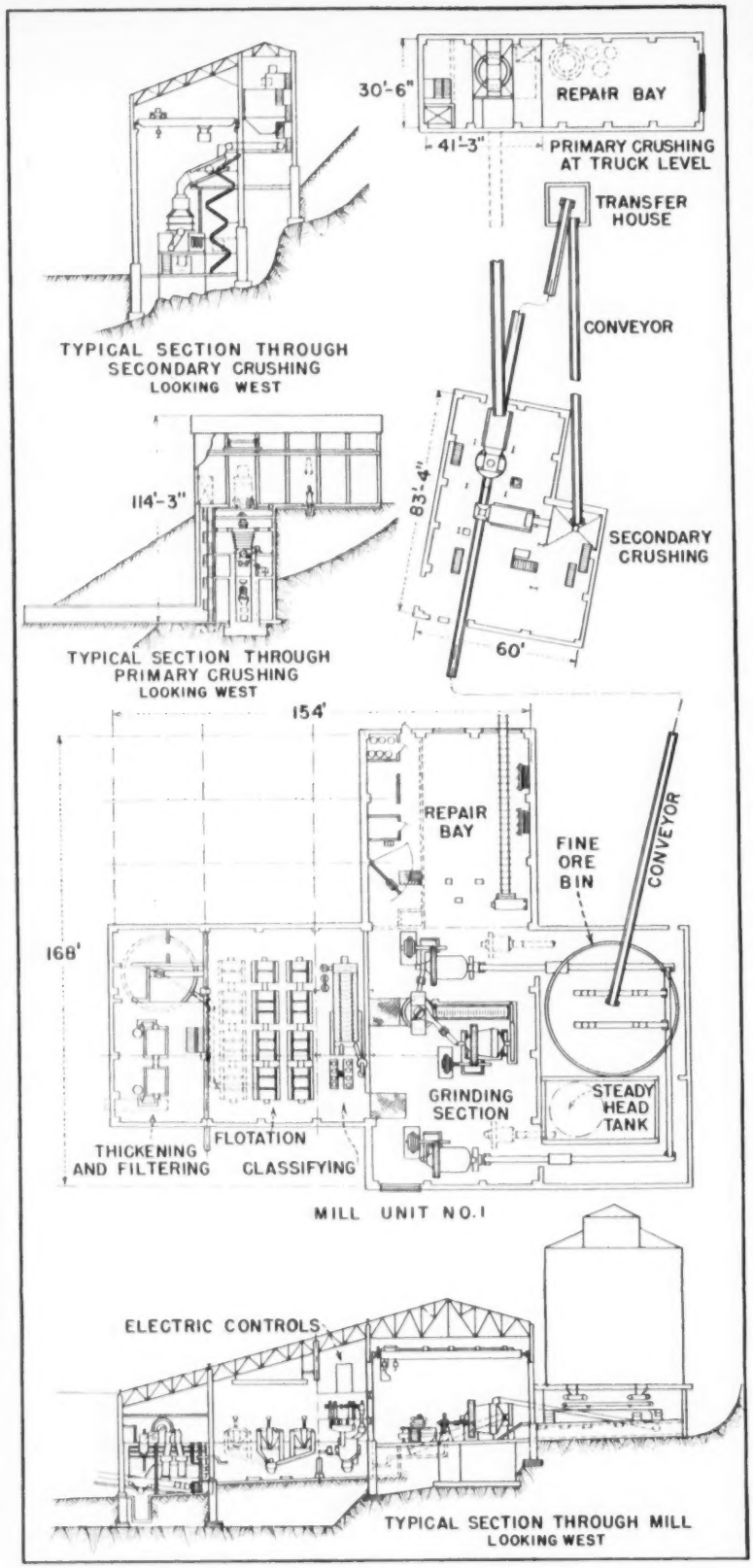
Announcement was made in the fall of 1951 by the Cleveland-Cliffs Iron Co. and the Ford Motor Co. of their plans to proceed near Ishpeming, Mich., on the Marquette Range, with the first commercial development of the nonmagnetic jasper iron formation, the material which is to Michigan what magnetic taconite is to Minnesota. Further information disclosed that the property would be called the Humboldt mine, and would be operated by Cleveland-Cliffs for the Humboldt Mining Co. The property is to be developed as an open-pit mine with a plant for beneficiating the iron-bearing material by froth flotation. The initial capacity of the first unit is 200,000 tons of concentrate per year. This production would be increased materially by construction later of additional units. The product will be utilized by Ford as a sinter feed at their Rouge plant. What preceded this announcement, what the plans are, and where the project stands currently are questions to be answered in this article.

THE GROUP OF MINES which, as consolidated, now form the Humboldt mine, are located 12 mi. west of Ishpeming, Mich. In the past, they were worked from 1865 to 1920, producing a total of 1,368,546 tons of hard lump specularite and magnetite iron ore. Following suspension of operations in 1920, the properties lay idle until acquired by the Cleveland-Cliffs Iron Co. in 1948. Exploration activity began in 1949 with a diamond-drilling program to test the iron formation for metallurgically treatable material. Eighteen holes were drilled for an aggregate total of 7,373 ft.

Initial operations at Humboldt will be conducted, it is expected, on a 12-months-per-year basis for the production of 200,000 tons of concentrates. Pit operations will be conducted on two shifts per day, with the concentrating plant running on a three-shift basis. The map opposite shows the physical layout at the Humboldt as planned for the proposed ultimate pit, concentrator, office, and shop buildings, stocking area, tailings disposal area, railroad and other facilities that are to be provided.

The orebody consists of an enriched phase of the Negaunee iron formation striking roughly N. 23 deg. E. and dipping 60 deg. to the west. The enriched zone averages 225 ft. in normal thickness and is immediately below the Goodrich quartzite hanging wall. The ore consists of specular hematite, magnetite and martite with a chert gangue. The hanging-wall contact is well defined between jasper and conglomerate or quartzite. The footwall is irregular, varying between an enriched hematite and magnetite phase and the lean siliceous metamorphic iron formation footwall. Thin basic sill-like intrusives cut the enriched orebody with folding and faulting, further complicating the orebody. Drift cover over the deposit varies in depth from nothing, at the numerous outcrops on the footwall side of the proposed pit, to a depth of 50 ft. along the north and southwest corners of the pit. Ledge surface is very irregular and offers a problem for early pit development.

Open-pit methods will be used in mining. Drilling for initial pit development will be done with churn drills and wagon drills; however, a jet-piercing machine will be used for the primary production drilling after the initial development is



CRUSHING AND FLOTATION PLANTS, in plan and sections as indicated. Plans of primary and secondary crushing plants have been shifted to left for convenience in making drawing.

completed. A bench height of 35 ft. has been tentatively selected which may be changed later as experience is obtained at this property. The benches will be cut and mined from hanging to footwall in an effort to obtain the best blasting results and to produce a uniform mill feed. The ore will be loaded by a 5-cu. yd. electric shovel into 22-ton diesel trucks for haulage to the crushing plant.

In the Mill

The pit ore will be dumped into a 48-in. gyratory crusher for reduction to around 7 in. The crushed ore will discharge into a 50-ton surge hopper below the crusher. The ore will be withdrawn by gravity, controlled by a chain-type feeder, and fed into a buffer belt for feeding a 42-in. belt conveyor for transportation to the secondary and tertiary crusher buildings. Here, the ore will be screened on a 6 x 12-ft. double-deck vibrating screen to yield plus 2-in. and minus 2-in. material. Oversize will be fed to a 7-ft. standard cone crusher set at 2 in. on the closed side. Screen undersize and crusher product will be combined on a reversible buffer belt below the secondary crusher. At this point the tertiary crusher can be by-passed, sending 2-in. feed into the mill. The normal crushing circuit, however, will consist in conveying from the secondary crusher by two 36-in. belts to a 150-ton surge bin. From this bin the ore will be drawn by a belt feeder which discharges onto a 6 x 14-ft. double-deck vibrating screen. The oversize (plus ½ in.) from this screen will feed by gravity into a 7-ft. fine-reduction cone crusher set to give a product 90% minus $^{9}/_{16}$ in. The crusher product and the screen undersize will join for conveying to an 1800-ton live storage fine-ore bin ahead of the mill.

Four drawpoints are to be provided in the bottom of the fine-ore circular bin. Belt feeders will be used at the drawpoints, discharging on 24-in. belt conveyors for transportation to the grinding section. The grinding circuit will include an open-circuit 9 x 12-ft. rod mill, which is to discharge into a Hydroscillator. The latter's rake product will be the feed for an 11 ft. 3 in. x 6 ft. 10 in. ball mill, grinding in closed circuit with the Hydroscillator. Liberation is achieved at a 65-mesh grind.

Supplementing this normal flow, an experimental test will be run

with a 2-in. feed from two stages of crushing to two stages of rod milling followed by classification and ball milling. The relative merits of the two systems will then be valuated for future expected additions to this first unit.

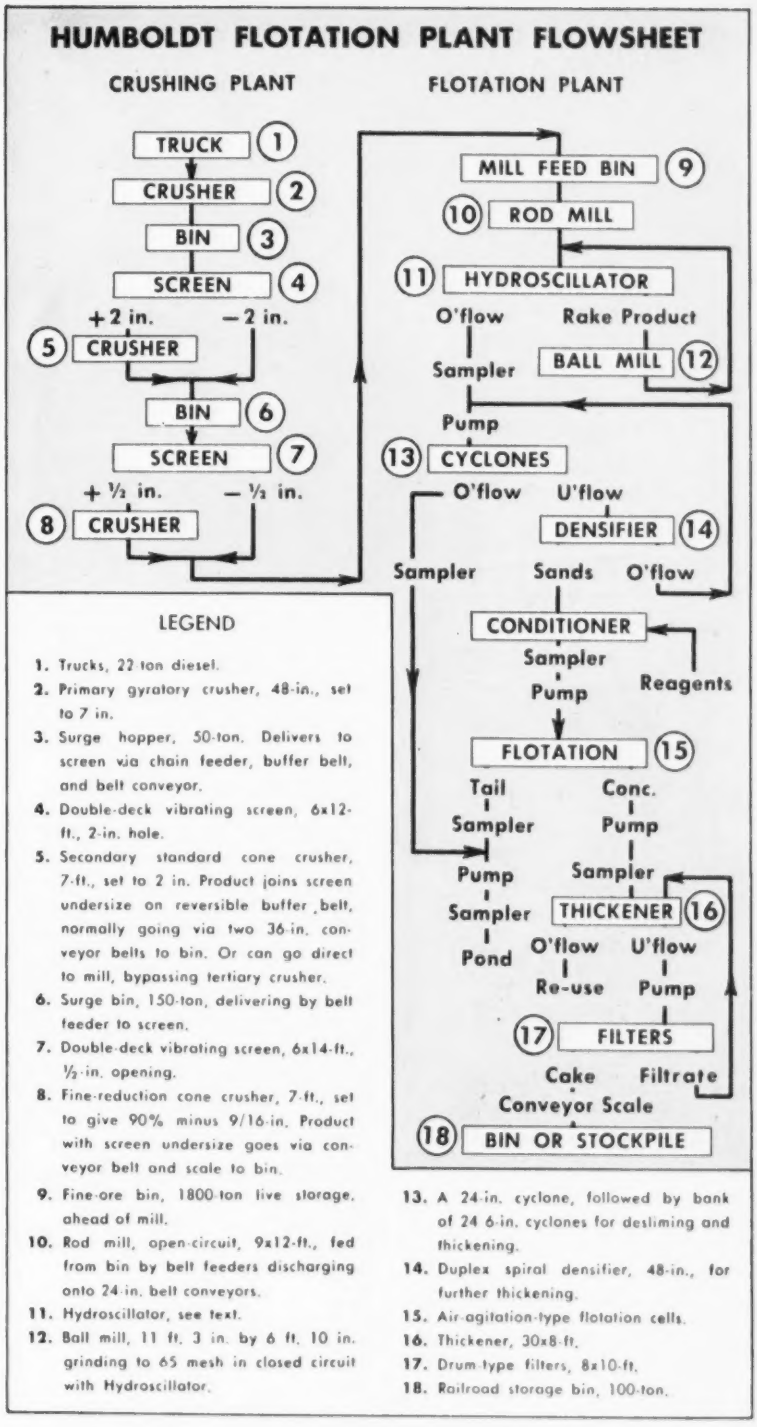
The classifier overflow is to be pumped to a 24-in. cyclone followed by a bank of 24 6-in. cyclones for desliming and thickening. The underflow from the cyclones will be discharged into a 48-in. duplex spiral densifier for further thickening. The overflow from the secondary cyclones will go into the tailings. The sand product from the 48-in. densifier will go to conditioners and thence to air-agitation-type flotation cells which make a final tailing and a finished concentrate. Several anionic flotation processes have been developed which are economically applicable. To date the ultimate reagent combination has not been determined definitely. The concentrates will be pumped into a 30x8-ft. thickener, from which the underflow will be pumped to 8x10-ft. drum filters. The filter cake will be conveyed to a 100-ton storage bin for shipment or stockpiling. Filtrate will return to thickener.

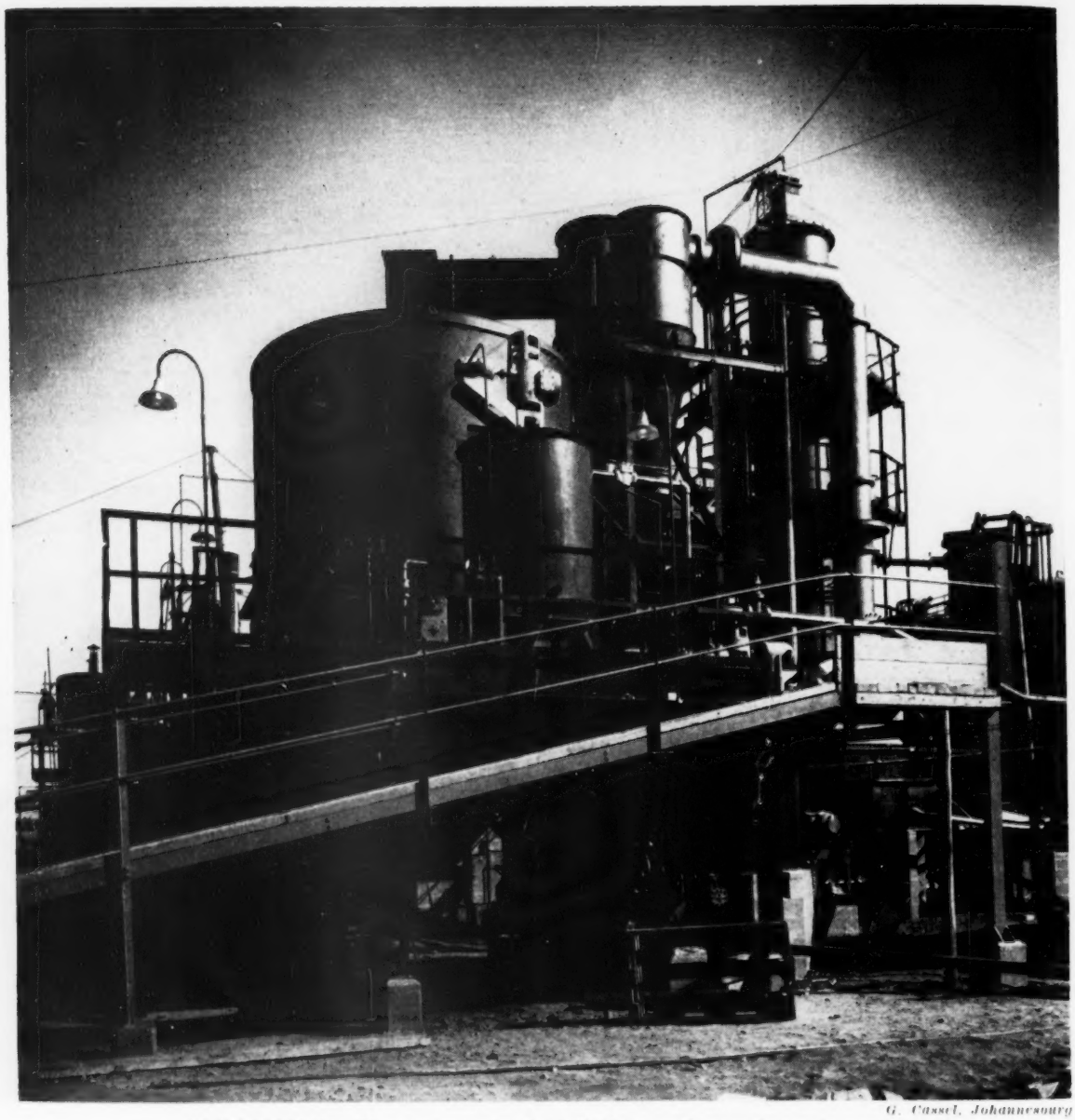
Work Is Making Progress

As of Jan. 1, 1953, a number of the initial development phases of the Humboldt project had been completed, and favorable progress was being made on the remainder. All excavation, both earth and rock, for the plant has been completed. Ninety percent of the concrete foundations for the secondary crusher and mill are now in, and foundations were to be started in the primary crusher building early in 1953. Building steel for the mill building was on hand. Actual erection began last month. All major equipment items for the concentrator were on order, and all of the major mining equipment had been received and was in operation. In all, 140 acres of land have been cleared and all grading in the office and shop area completed. Construction of tailings dikes is under way.

Power facilities by the Cliffs Power & Light Co. have been installed for the construction stage. The Lake Superior & Ishpeming R.R. reached the property in May, 1952, following completion of 8 mi. of track from existing facilities. Five homes and two commercial buildings were moved in the fall to allow unhampered pit development. Relocation of U. S. Highway 41 was essentially completed. Necessary preliminary stripping of overburden from the open pit was well under way. Construction of the office and shop buildings was proceeding satisfactorily at the start of the year, with all foundations in, building frame up, and sheeting well started.

Pending unforeseen delays, initial production for shipment has been set for early 1954. Planning and design of these facilities throughout has proceeded with the idea of providing this first commercial development of jasper iron formation with sufficient flexibility to meet the inevitable press of ever-changing technological research.


HUMBOLDT FLOTATION PLANT FLOWSHEET
CRUSHING PLANT
FLOTATION PLANT
TRUCK 1
CRUSHER 2
BIN 3
SCREEN 4
+2 in.
−2 in.
5 CRUSHER
BIN 6
SCREEN 7
+½ in.
−½ in.
8 CRUSHER
MILL FEED BIN 9
10 ROD MILL
11 HYDROSCILLATOR
O'flow
Rake Product
Sampler
BALL MILL 12
Pump
13 CYCLONES
O'flow
U'flow
DENSIFIER 14
Sampler
Sands
O'flow
CONDITIONER
Sampler
Pump
Reagents
FLOTATION 15
Tail
Conc.
Sampler
Pump
Pump
Sampler
Sampler
THICKENER 16
Pond
O'flow
U'flow
Re-use
Pump
17 FILTERS
Cake
Filtrate
Conveyor Scale
18 BIN OR STOCKPILE
LEGEND
1. Trucks, 22 ton diesel.
2. Primary gyratory crusher, 48-in., set to 7 in.
3. Surge hopper, 50-ton. Delivers to screen via chain feeder, buffer belt, and belt conveyor.
4. Double-deck vibrating screen, 6x12-ft., 2-in. hole.
5. Secondary standard cone crusher, 7-ft., set to 2 in. Product joins screen undersize on reversible buffer belt, normally going via two 36-in. conveyor belts to bin. Or can go direct to mill, bypassing tertiary crusher.
6. Surge bin, 150-ton, delivering by belt feeder to screen.
7. Double-deck vibrating screen, 6x14-ft., ½-in. opening.
8. Fine-reduction cone crusher, 7-ft., set to give 90% minus 9/16-in. Product with screen undersize goes via conveyor belt and scale to bin.
9. Fine-ore bin, 1800-ton live storage, ahead of mill.
10. Rod mill, open-circuit, 9x12-ft., fed from bin by belt feeders discharging onto 24-in. belt conveyors.
11. Hydroscillator, see text.
12. Ball mill, 11 ft. 3 in. by 6 ft. 10 in. grinding to 65 mesh in closed circuit with Hydroscillator.
13. A 24-in. cyclone, followed by bank of 24 6-in. cyclones for desliming and thickening.
14. Duplex spiral densifier, 48-in., for further thickening.
15. Air-agitation-type flotation cells.
16. Thickener, 30x8-ft.
17. Drum-type filters, 8x10-ft.
18. Railroad storage bin, 100-ton.



G. Cassel, Johannesburg

FLUOSOLIDS*: More uses, more installations and more bases to cover.

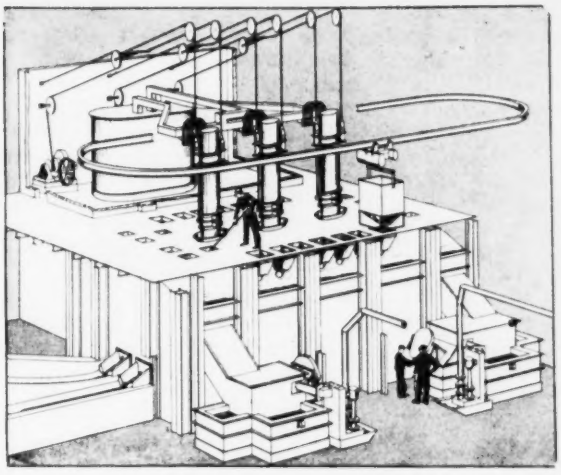
New Processes Feature Gains in Nonferrous Metallurgy

A. W. SCHLECHTEN
Professor of Metallurgy
Missouri School of Mines
and Metallurgy
Rowland, Mo.

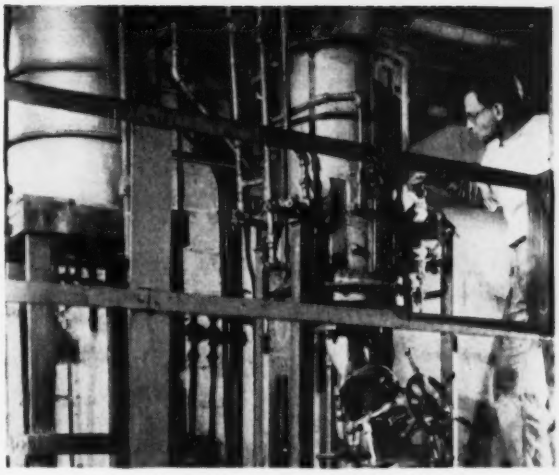
SIGNIFICANT ADVANCES in any one field of science are known to follow irregular cycles. There is a period of no activity followed by a time of intensive research resulting in new knowledge. Often the same important discoveries are made simultaneously in two widely separated places with no apparent reason for duplication by two men working from different approaches.

Advances in technology probably follow a similar pattern, but they

* FluoSolids section of the sulphuric acid plant at West Rand Consolidated Mines. Acid is used in uranium leach extraction plant.



STERLING FURNACE:
What's to become of horizontal zinc retorts?



CHEMICO PROCESS:
One part chemistry, one part mystery.

also seem to require a certain favorable economic climate. There must be a real need for improved methods and performance coupled with sufficient faith in the future so that management will pay for new equipment and permit the trial of new procedures.

Evidently we are now in a time of rapid advance for nonferrous metallurgy, if we can judge from the new processes and new equipment being put into use.

Several of the most important developments have been described in detail in *Engineering and Mining Journal* during the past year. If you didn't read the articles on the Sterling furnace, updraft sintering, and pressure leaching, you should look for them now.

Sterling Process

The Sterling process of the New Jersey Zinc Co. for smelting zinc succeeds in overcoming many of the difficulties that plagued previous attempts to use arc furnaces for this purpose. Preheating the charge not only economizes on fuel, but also eliminates moisture, volatiles from the coal, and some dust, all of which would hinder efficient zinc condensation if they were evolved in the reduction furnace. Another control is to leave from 1.5 to 6% of the iron unreduced to prevent possible reduction and volatilization of other slag constituents which would form nuclei for blue powder formation. Steady charge rates and power input yield a uniform flow of gas and fume to the condenser in contrast to the violent fluctuations that were said to be typical of the Trollhattan furnace. Probably the most important feature is the highly efficient splash condenser which is said to yield 75 to 80% of the zinc as molten metal.

The 95% recovery of the Sterling process may be the deciding factor in selecting it in preference to other modern methods. Electrolytic, electrothermic, vertical, and horizontal retorts are contrasted as to cost by C. W. Jensen in a recent article. He can see no justification for operating horizontal retorts even when considering the cost of new plant. However, his costs are for producer gas furnaces and are not typical of our U. S. plants running on natural gas.

More in the realm of speculation are the possibilities of smelting zinc in a blast furnace. Many experiments and theoretical considerations have shown that an orthodox blast furnace is not feasible for this purpose, but there have been proposals to reverse the gas flow or to build a furnace similar to a Fluo-Solids reactor. The use of oxygen would reduce the volume of combustion gases that would go to the condenser, and modern condenser designs would give better results.

Improvements in electrolytic zinc practice at the plant of the American Zinc Co. are described by Moore and Painter. Among the new features is the addition of copper sulphate and arsenic trioxide previous to purification of the leach solutions with zinc dust. Cobalt is reduced to 0.001 grams per liter and other harmful impurities are eliminated. Precautions must be taken to avoid poisoning from arsine gas. In the cell room strontium carbonate is added to the electrolyte to reduce the lead content of the cathode zinc. Cathode melting furnaces are equipped with fume scrubbers and provisions have been made for dross treatment. Plans are being made for a continuous casting system.

Mechanical casting will also be a feature of the new addition to the zinc plant at Trail. A low frequency induction furnace will be installed for cathode melting and will handle 500 tons of slab zinc per day. The entire project is scheduled for completion during the first half of 1953.

The desulphurization of zinc concentrates is the subject of many investigations. The updraft sintering machine, which we will mention again, has been shown to work satisfactorily on zinc bearing materials. Whether it would have as many advantages for zinc as it does for lead, is doubtful.

Flash Roasting

K. D. McBean has described the present status of suspension or flash roasting particularly as applied at Trail for treatment of zinc concentrates. Of especial interest is his diagram of a typical modern installation which is somewhat different from the one original drawing we have seen reproduced year after year in books and articles describing flash roasting. The most obvious change is the elimination of hearths above the combustion chamber. The two bottom hearths are for drying; wet concentrate is introduced into the hearth next above the bottom. Dried concentrate is removed from the bottom hearth,

ground, and injected into the top of the combustion chamber. If the dust from the collectors is returned to the hearths for further oxidation, sulphide sulphur can be reduced to 0.3% and sulphate to 0.4%. One unit will treat 150 tons per day of concentrate and require only one operator per eight-hour shift. High concentrations of SO_2 can be obtained in the gases.

FluoSolids

FluoSolids roasting of sulphide concentrates is of interest at several zinc plants either preliminary to sintering or to prepare calcine for leaching. The close control of temperature, sulphate formation, and gas composition are obvious advantages.

An interesting point was brought out in a discussion by W. T. Marston of a FluoSolids roaster for treating an arsenical gold concentrate at the Negus Mines. A two-compartment roaster is used. In the first compartment, reducing conditions are to be maintained so that arsenic sulphides will be volatilized from the concentrate; oxidation of the iron sulphides takes place in a second compartment. A similar arrangement might be used for volatilizing lead and cadmium sulphides from sphalerite concentrates. A paper by C. M. Hsiao and the author, published by the AIME, shows that PbS and CdS are much more volatile than NzS and subsequent experiments have shown that lead and cadmium can be eliminated from a concentrate as sulphides to a much greater extent than if they are in the form of oxides. The work of Kenworthy and Absalom at the Bureau of Mines also proves this possibility and shows further that more than germanium can readily be volatized as a sulphide.

Roasting of iron sulphides for sulphuric acid manufacture seems to be an ideal application for the FluoSolids process. It is reported that the new Yerington copper leaching operation of Anaconda will get its acid in such fashion. Another possibility for copper recovery is reported by G. G. Copeland, who described the use of a FluoSolids unit for the sulphate roasting of a copper sulphide concentrate. The soluble copper is leached and the solution electrolyzed for recovery of copper; the spent electrolyte is returned for leaching. (Author's Note: Some provision must be made to prevent buildup of H_2SO_4 in the circuit.) Pilot plant results have shown 97% extraction, and plans are on the drawing boards for a commercial plant to be constructed in Japan.

The poor copper metallurgist hardly knows whether to scrap his smelter in favor of such a scheme as just described or whether to adopt the widely-publicized pressure leaching systems recently developed for copper, nickel, and cobalt ores. Evidently the process or processes consist of acid or ammonia pressure leaching followed by selective reduction of metals from the solution by hydrogen under pressure. With all due respect to the competent metallurgists who are developing the various aspects of this process, the information released to the public so far sounds as though it were written by the sales manager. It has been suggested that the process is applicable to all metals below a certain point in the electromotive series; that it could be adopted without much change to present plants; that a plant could be built at the mine to save transportation of ore; and that it is a great advantage to recover the copper as a shiny powder. We don't doubt that the process has great merit, but any estimate of its possibilities will have to await the disclosure of some more facts.

Improved Copper Smelting

In the meantime, advances have been made in more orthodox smelting methods for copper. A description of the Ajo smelter is scheduled for the 1953 AIME meeting; this new plant has several novel features worthy of note. The reverberatory, which is 30 ft. by 100 ft., lies parallel to the converter aisle. There are three tap holes for matte on 20 foot centers on the side nearest the converters. The furnace is charged with "slingers," which throw the material from high speed belts into the furnace. Maximum capacity of the slingers is 2 tons per minute. This reverb has a panel near the uptake to keep the heat in the furnace similar to the arrangement used at Morenci.

Another feature at Ajo is the practice of transferring the blister copper from the 13-by-30-ft. Peirce Smith converters to a 12 ft. Great Falls converter. The blister is blown in the Great Falls converter for about 30 minutes to a flat set, and then transferred to the anode furnace where little skimming or blowing is required. A complete description of the new sulphide smelter at Chuquicamata has been published in *Mining Engineering*, Dec., 1952. There seem to be no departures from orthodox metallurgical practice or equipment but great thought has been given to detail of design and provision for future expansion. The article by Wilbur Jurden on the general design of the new plant is of particular interest because it describes the change in concept for the overall layout of such plants.

R. Thompson, writing of present day operations at Garfield, describes a third blowing period as a part of their converting procedure. After formation of blister copper, a lead-free siliceous flux is added and blowing is continued for 20 minutes to eliminate small amounts of lead in the blister. The article also tells of the new anode casting installation completed in 1950 and of the problems in making sulphuric acid from converter gases.

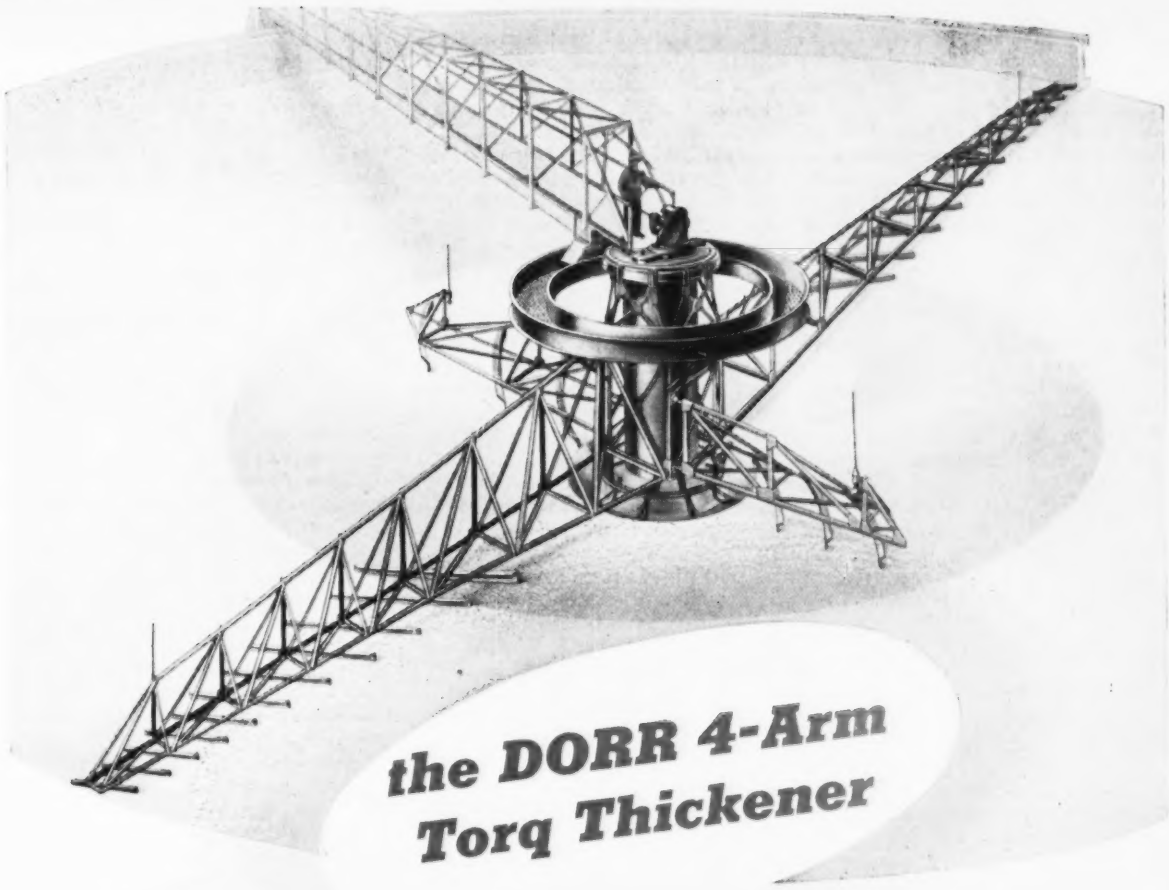
At the Lubumbashi smelter in the Belgian Congo the annual production of 70,000 tons of blister is handled in one 13-x-30-ft. converter according to L. A. Lyons. One explanation is the 64 to 65% grade of the matte, which, incidentally, gives a 12 to 17% Cu converter slag. It is necessary to heat the converter with pulverized coal burners between cycles. The refractory in the tuyere zone is periodically patched with a magnesite-pitch mixture. Along this line is a description by Paul Klare of experiments with sintered dolomite and tar as a patching mixture.

Hot Patching

Hot patching of reverbs, at McGill, according to E. Pesout, has almost eliminated down-time for arch repairs. The mix of 93½% SiO_2, 6½% bentonite, and 40% water can hardly be called a slurry, because a semi-gelatinous mass is formed. This material when blown against the arch, rapidly loses moisture and forms a rigid porous sponge. Eroded portions, particularly around charge holes, can be built back to original dimensions.

Autogenous smelting of copper sulphide concentrates at Outokumpu Oy by a combination roaster and matte furnace has been improved by perfecting the heat exchanger which preheats the incoming air. This process and the recovery of iron from reverb slags, is described in a German article by Petri Bryk.

The flash smelting process of International Nickel Co. which uses oxygen or oxygen enriched air has not been revealed to the public gaze,



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but R. W. Allgood has discussed the plans for utilizing the gases to make acid. Gases running 75% or better SO_2 will be used to manufacture liquid SO_2 which will be sold to sulphite paper mills. An annual production rate of 90,000 tons was predicted for the beginning of 1953, which would be equal to the total production of the rest of the free world.

In the laboratories some fundamental research is under way to give us a better understanding of copper metallurgy; Michal and Schuhmann of M.I.T. have reported on the thermodynamics of iron-silicate slags saturated with solid SiO_2. The University of British Columbia is studying matte-slag equilibria. A study at Colorado Mines of the treatment of copper roaster and reverb flue dust shows difficulties in leaching or flotation; the authors suggest the possibility of selective fuming.

Lead Metallurgy

In lead metallurgy the most interesting news concerns the updraft sintering machine developed at Port Pirie and described by W. R. Burrow. The results from a 2-by-12-ft. machine are so encouraging that a 10-x-77-ft. machine is being built. The chief advantage is the elimination of windbox lead, although it is also claimed that there is less corrosion of flues and grates. The SO_2 content of the gases was higher than for downdraft machines and a satisfactory sinter could be made in one pass. The chief difficulty in development of the new machine was the problem of ignition. The solution was to have a thin layer of charge ignited in a preliminary downdraft compartment and then add the main portion of the charge bed as the grates move to the updraft windbox. When sufficient operating data have been obtained from the 10x77-ft. unit, it is expected that the existing machines will be converted to updraft.

The continuous softening and desilverizing of lead, first developed at Port Pirie, is now used at the Monterrey refinery and has been described by Ross and Peabody. They sum up the operation by saying that there is less labor but more costly repairs and maintenance. The softened lead runs less than 0.001% As and about 0.05% Sb. The desilverizing units each treat from 8 to 16 tons per hour reducing the silver content to 0.02 oz. per ton. The residual zinc in the bullion is removed by the Harris process and the bismuth is removed by the Kroll-Betterton process.

A theoretical study of the drossing of lead in still air has been made by Hofman and Mahlich. They found that the rate of drossing was reduced and suppressed by Al, Sn, Sb and Zn, but increased by Cu, Cd, and Mg. The controlling factor was the nature of the oxide film and the rate at which lead could diffuse through it.

As part of the modernization of the lead smelter at Trail, a baghouse has been built. One problem was to cool the 153,000 cfm of gases ranging in temperature from 350 deg. to 1100 deg. F. down to a safe 210 deg. F. A water spray tower was built which did the job, but initially caused some trouble from corrosion and excessive slime. Orlon bags have been superior to the woolen bags originally installed; other synthetic fibers are being tested. The new sintering plant will not be completed until the end of 1953, although two of three 10-ft. by 60-ft. sintering machines are expected to be in operation early in the year. It is said that electric smelting of the sinter is being given serious consideration.

Carter and Samis have described the adverse effects of high temperature roasting on the extraction of gold from refractory ores by cyanidation. Possibly the gold is occluded by fused oxide particles. They suggest the advantage of FluoSolids roasting, or even better yet, the aqueous oxidation of the pyrite in NaOH under pressure. This procedure was investigated by Stenhouse and Armstrong and is a part of the program of pressure leaching investigations being conducted at the University of British Columbia.

Low-Grade Chromite

The utilization of low-grade domestic chromites has been considered recently by a number of writers. Various schemes of selected reduction, chemical treatment, and electrolytic extraction have been investigated. According to Doerner the concentrates from the Mouat and Benbow mines in Montana will run about 40% Cr_2O_3 as against a desired 48%. Because of the low Cr/Fe ratio, these concentrates yield upon smelting a 55% ferrochrome versus the 70% standard figure. Evidently the main job is to convince the buyers that 55% ferrochrome can be used in many applications.

Titanium

Articles on titanium have been so numerous during the past year that a reviewer can hardly wade through them. Most of them have one thing in common: they are nothing more than a rehash of old information. Exceptions to this statement can be found; an excellent summary of all aspects of titanium metallurgy was printed in *Iron Age*. Dr. W. J. Kroll, the father of present day titanium industry, had an article in *Metal Industry* on the basic chemical facts governing titanium processes. He pointed out that the secrecy surrounding the developments in titanium metallurgy today probably means that everyone is doing the same thing and making the same mistakes. The interest in the subject can be estimated from the registration of 600 men for the titanium sessions at the fall meeting of the AIME. The production of titanium ingots weighing over a ton are ample proof that real progress is being made even though nobody shows the slightest inclination to say what he is doing.

In the past, reviews of nonferrous extractive metallurgy have ignored aluminum for the simple reason that there was never any new published information. It almost seemed as though the process was exactly the same as when first discovered by Hall, except that modern day cells are larger. Perhaps there will be more interest and more discussion of details of equipment and operations now that we have three domestic aluminum producers and Anaconda is planning to become a fourth. For example, a review of F. V. Andreae of the work of L. Ferrand indicates that present U. S. practice leaves much to be desired. Periodic feeding of Al_2O_3 to the cells causes violent fluctuations of conductivity and temperature as the alumina concentration varies between a minimum of 1-2% up to 7-8%. Optimum conditions are claimed to be not far from the minimum which will give the anode effect, thus continuous feeding would be desirable.

Under the heading of miscellaneous but valuable readings in extractive metallurgy, we would like to recommend the series of lectures on Principles of Extraction and Refining of Metals published by the Institution of Metallurgists: the book, Metallurgical Engineering by Schuhmann, and the articles by Kroll on Chlorine Metallurgy and those on Vacuum Metallurgy.

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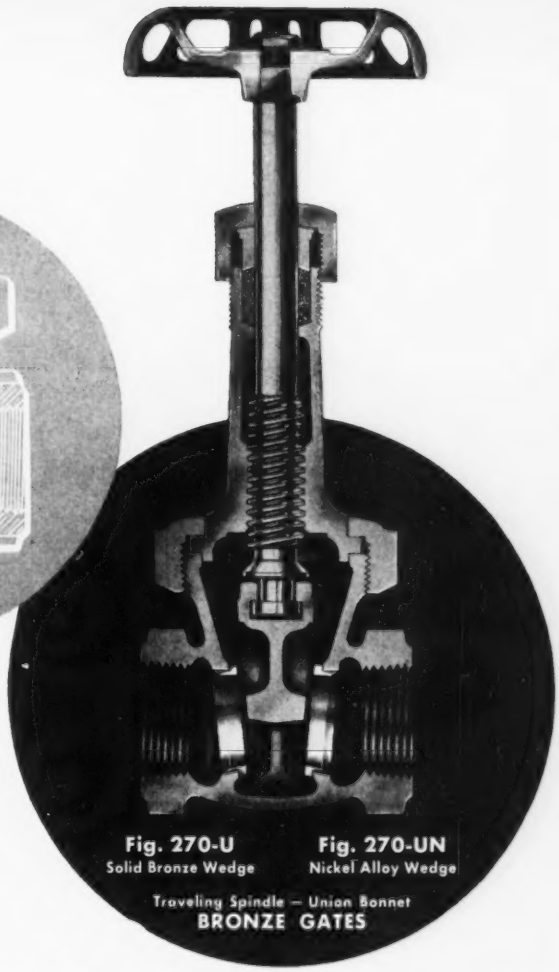

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MARKETS—Trends and Prices (Continued from page 69)

Copper Production by Countries

(American Bureau of Metal Statistics)
In Short Tons

	Jan.-Dec. 1951	Jan.-Sept. 1952	October 1952	November 1952
United States (a)	964,589	720,635	81,978	78,023
Canada (b)	269,971	193,285	20,938	.....
Mexico, crude	60,511	44,221	4,938	5,900
Chile, blister and/or refined (c)	396,937	302,924	38,164	.....
Peru, blister and/or refined	25,495	18,349	1,924	1,628
Fed. Rep. Germany, refined (d)	234,647	157,967	18,678	.....
Japan, refined (d)	100,254	80,136	8,413	.....
Australia, crude	16,984	15,971	.....	.....
Union of South Africa	36,104	26,383	2,747	.....
Rhodesia, crude	349,667	262,134	20,467	14,504
Totals	2,455,159	1,820,005	.....	.....

(a) Reported by Copper Institute as recoverable content of mine production or smelter production or shipments and custom intake. Does not include intake of scrap nor of imported ore except that received from Cuba and the Philippines. (b) Blister copper plus recoverable copper in concentrates, matte, etc., exported. (c) Does not include production of Paipote National Smelter. (d) Includes production from scrap.

Chrome Ore Imports

Imports of chrome ore (gross weight) into the United States, by grades and countries, in long tons:

	Oct. 1952	Jan.-Oct. 1952
Metallurgical:		
Afghanistan	.....	898
Cuba	.....	23,944
Greece	220	220
Guatemala	.....	1,302
India	.....	5,292
New Caledonia	14,625	48,709
Pakistan	.....	3,011
Philippines	.....	29,614
Sierra Leone	.....	19,620
So. Rhodesia	5,790	127,344
Turkey	33,207	328,180
Union of S. Africa	3,232	58,393
Yugoslavia	5,040	17,387
	62,114	663,914
Refractory:		
Cuba	.....	40,922
Philippines	56,907	295,206
So. Rhodesia	994	7,846
Union of S. Africa	1,033	18,905
	58,934	362,879
Chemical:		
Union of S. Africa	11,065	143,628
Total all grades	132,113	1,170,421

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipments f.o.b. New York unless otherwise stated

MISCELLANEOUS METALS

January 31, 1953

Aluminum ingot, 99 plus percent, lb. (effective Jan. 22)	20½c.
Antimony, spot, lb., 5 tons and up but less than carload, in cases	37.97c.
Bismuth, ton lots, lb.	$2.25
Cadmium, commercial sticks, delivered, lb.	$2.00
Calcium, lb., ton lots, 98 percent, cast	$2.05
Chromium, 97 percent grade, lb., contract	$1.18
Cobalt, 97 to 99 percent, per lb.	$2.40
Germanium, lb.	$340.00
Indium, troy oz.	$2.25
Lithium, lb., 98 percent	$11.00 @ $14.00
Nickel, cathodes, lb., f.o.b. Port Colborne (a)	60c.
Magnesium, 99.8 percent, carloads, lb., producer's plant, Freeport, Texas	24½c.
Palladium, troy oz.	$24.00
Platinum (Official quotation wholesale lots) troy oz.	$90.00
Quicksilver, flask of 76 lbs., 25 flasks or more	$210 @ $212
Selenium, 99.5 percent, lb.	$3.00 @ $3.50
Silicon, minimum 97 percent, carloads, lb.	20c.
Tellurium, lb.	$1.75
Thallium, 100 lb. or more, lb.	$12.50
Titanium, 99.3 percent, lb.	$5.00

(a) Includes U. S. duty.

METALLIC ORES

Beryllium Ore, imported, 10% BeO, per unit	$46.00 @ $48.00
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry	
44% Cr_2O_3 no ratio	$27.00 @ $32.00
48% Cr_2O_3 3 to 1 ratio	$44.00 @ $56.00
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$9.45
Mesabi bessemer	$9.20
Mesabi, non-bessemer	$9.05
Lead (Galena), 80 percent, Joplin, Mo., ton	$173.70
Manganese Ore—Per long ton unit of Mn basis 48 percent manganese, nearby positions, subject to premiums and penalties, $1.18 @ $1.21 c.i.f. U.S. ports, duty extra. Long-term contract nominal at 90c. to 93c., c.i.f. duty extra.	
Molybdenum Ore, 90%, per lb. of MoS_2 f.o.b. mines	60c.
Tantalite, 60% concentrate, per lb.	$2.50 @ $3.00
Tungsten Ore, per unit of WO_3	
Foreign, 60 percent, f.o.b. foreign ports	$46.50 @ $48.00
Domestic, scheelite, 60 percent f.o.b. mill	$65.00
Vanadium Ore, per lb. of contained V_2O_5 f.o.b. mines	31c.
Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo., per ton	$84.00

(a) F.o.b. port of shipment.

METALLIC COMPOUNDS

Arsenous Oxide (arsenic trioxide) lb., in bbl. carload lots delivered	5½c.
Cobalt Oxide, 72½ to 73½%, ceramic grade, per lb.	$1.82 @ $1.84½
Copper Sulphate, 100 lb.	$8.95 @ $9.95
Germanium Oxide, lb.	$142.00

ALLOYS

Beryllium Copper, 4 percent Be, per lb. of alloy, 5 lb. ingot	$1.56
Ferrochrome, 65 to 69 percent, per lb. of Cr contained	24¾c.
Ferromanganese, 78 to 82 percent, gross ton, seaboard	$225
Ferromolybdenum, 55 to 65 percent Mo, lb. of Mo. contained	$1.32
Ferrosilicon, 50 percent, per lb. of contained Si	12.4c.
Ferrotungsten, 75 to 80 percent, lb. of W contained	$4.85
Ferrovanadium, per lb. of V delivered	$3.00 @ $3.25
Silicomanganese, Max. 1½ percent carbon, per lb. contracts	11.4c.
Spiegeleisen, per long ton, 19 @ 21 percent grade	$85.00

NON-METALLIC MINERALS

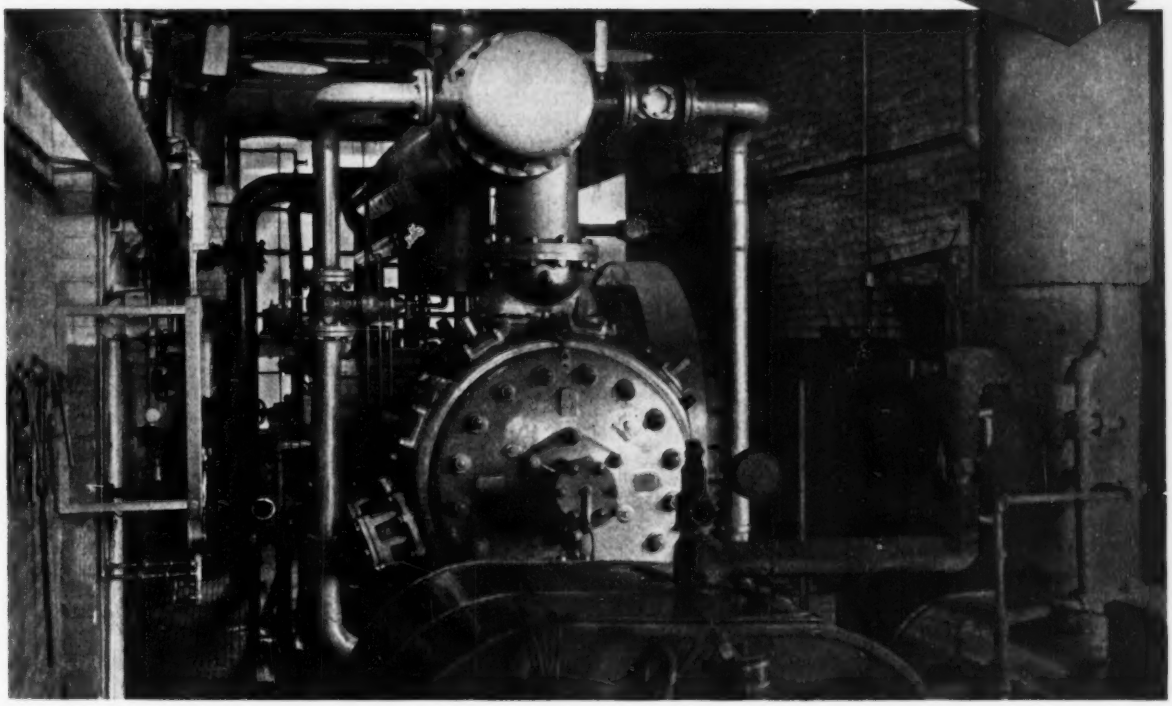
Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds) ton:	
Crude No. 1	$960 @ $1,500
Crude No. 2	$595 @ $900
Spinning fibers	$321 @ $514
Shingle fibers	$150 @ $200
Paper stock	$109 @ $137
Waste	$77
Shorts	$35 @ $70
Asbestos, Vermont, f.o.b. Hyde Park:	
Spinning fibers	$279.50 @ $302.00
Shingle stock	$135.00 @ $162.00
Paper stock	$81.50 @ $115.00
Waste, stucco or plaster	$71.40
Refuse or Shorts	$34.00 @ $63.00
Barytes, f.o.b. mines:	
Georgia, crude, per long ton	$13.00 @ $13.50
Missouri, 93 to 94 percent $BaSO_4$, per short ton	$10.50 @ $10.40
Bauxite, long ton, f.o.b. point of shipment:	
Domestic, crude, 50 to 52 percent (not dried)	(a) $5.00 @ $5.50
Domestic, chemical, 55 to 58 percent	(a) $8.50 @ $9.50
Domestic, abrasive, 80 to 84 percent	(a) $18.00 @ $18.50
China Clay, f.o.b. mines, ton:	
Georgia, filler and ceramic grades	$8.50 @ $9.50
North Carolina ceramic grade	$20.25 @ $22.25
Feldspar, bulk ton:	
Potash or soda feldspar, 200 mesh, ceramic grade	$18.50 @ $22.25
Glass feldspar, white, 20 mesh	$11.75 @ $12.50
Fluorspar, f.o.b. mines, bulk, 70% effective ton	$43.00
60% effective CaF2	$40.00
Acid 97% concentrate, bulk, ton	$60.00
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00 @ $14.00
Magnesite, per ton dead-burned, bulk, f.o.b. Washington	$39.56
Mica—Domestic, f.o.b. mines. Punch 12 to 22c. per lb. according to size and quality. Sheet clear, 1½ x 2 inch, 80 to 85c.; 2 x 2 inch, $1.10 to $1.20; 2 x 3 inch, $1.50 @ $1.60; 3 x 3 inch, $1.80 @ $1.90; 3 x 4 inch, $2.20; 3 x 5 inch, $2.40; 4 x 6 inch, $3.15; 6 x 8 inch, $4.25. Wet, ground, very fine, $140 @ $155 per ton. Bulk sales, dry ground: $32.50 @ $70.00 per ton Scrap $32 and up.	
Ocher, Georgia, ton, in sacks	$26.25
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	Not quoted
Sulphur, Texas, mines, long ton	$22.00
Talc, f.o.b. works, ton:	
New York, purified	$18.50 @ $20.00
Vermont, extra white	$12.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$30.00

(a) Nominal.

IRON AND STEEL

Pig iron, gross ton, basic, Valley furnaces	$54.50
Steel, f.o.b., Pittsburgh billets, net ton	$59.00
Structural shapes, 100 lb.	$3.85

Is available floor space holding back expansion of your plant air facilities?



Haven't got the floor space for additional plant air facilities? Don't be too sure!

How about the nooks and crannies, or right in among your machine tools? Other plants are squeezing Clark Balanced/Opposed Compressors in many such "impossible" places. The above illustration, in an aluminum forging plant, is a typical example. Here a 600 hp, 3200 cfm Clark unit was squeezed into a 20 x 13 ft. floor area.

It's a fact that a Clark Balanced/Opposed Compressor can be moved in anywhere. One of the reasons is its compactness. Another is its absolutely vibration-free performance. You can set it in a corner, on a second floor, or alongside even the most delicate of machining operations. The savings in building, piping and installation costs are considerable.

For full information on this modern, motor-driven compressor (150-4500 hp range), request Bulletin 118, or call your nearest Clark representative.

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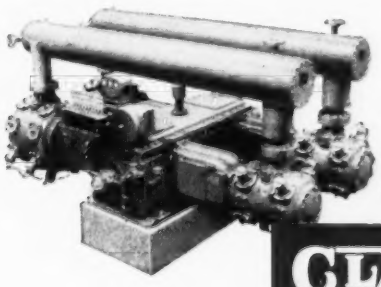

PRECISION BY THE TON . . .

CLARK balanced/opposed compressors

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WASHINGTON IMPACT

Morton A. Reichek, McGraw-Hill Washington News Bureau

Free Nation Stockpiling Proposed—Hanna Gets Nickel Contract—Mine Output Highest

DEFENSE MOBILIZATION DIRECTOR Henry H. Fowler bowed out of office last month with the provocative proposal that NATO countries with substantial war production capacity start building up strategic stockpiles of their own or be given access to a collective Free World stockpile.

His argument for Free World stockpiles is as follows: Strategic stockpiles are designed to cover anticipated materials deficiencies in wartime; "Yet, if war came, the critical margin of production of our allies as well as our own in many instances would depend upon the materials which had been stored against such a contingency."

The proposal is not new; it has been seriously discussed before in government and business circles. But it hasn't been publicly recommended by a top official. Last year, in the stockpiling section of its natural resources policy declaration, the Chamber of Commerce stated that "any legislation authorizing funds for economic or military aid to other countries should include a clear and definite provision for the use of such funds, in addition to those included in the military budget, for the acquisition of strategic and critical materials."

The United States presumably is the only NATO country maintaining a strategic stockpile that is inviolate except during national emergencies. We have successfully pressed for recognition of a stockpile requirement at IMC. Other national stockpiles, such as Great Britain's, are only working inventories for industry. And disposal of her excess lead and zinc stocks makes it obvious that Great Britain is not considering a strategic stockpile program now.

Fowler's proposal raises two immediate questions: (1) How would the stockpiles be financed, and (2) where would they be located. On the surface, maintenance of an inviolate stockpile of strategic materials looks more like a luxury than a necessity for most NATO countries, while Congress' go-slow temper on foreign aid would block U. S. appropriations for such a program this year.

The strategic accessibility of Western Europe would make it necessary to build up the foreign stockpiles in the U. S. or elsewhere outside continental Europe. It would be risky to put valuable stocks of strategic materials within the grasp of a potential enemy.

Congressional Activity

Little activity is apparently expected by the House Subcommittee on Mines and Mining during this session of Congress. The House Republican caucus has had to dip lower and lower in seniority to come up with a mining subcommittee chairman.

Rep. Wesley A. D'Ewart (Mont.) was originally slated to take over, then Rep. John P. Saylor (Pa.). Both evidently found more attractive pickings in other committee assignments. The new chairman is Rep. J. Ernest Wharton, an upstate New York lawyer, serving his second term in Congress. The parent House Interior and Insular Affairs Committee has had a similar experience. Rep. Dean P. Taylor (N.Y.) declined the chairmanship to become a member of the Judiciary Committee. Rep. A. L. Miller (Neb.), a farmer and surgeon, now heads the committee.

On the Senate side, there will be a standing five-man sub-committee on mines and mining for the first time since 1948. Sen. George W. Malone (Nev.), a mining engineer by profession, is slated to assume the chairmanship. Under its former chairman, Sen. Joseph C. O'Mahoney (Wyo.), who was defeated in his bid for reelection, the Senate Interior and Insular Affairs Committee operated with special subcommittees only when there was mining legislation to consider.

The mining subcommittees were relatively inactive during the last Congress. Biggest order of business this session may be legislation to replace the minerals expansion provisions of the Defense Production Act, which expires June 30.

There is considerable sentiment on Capitol Hill that a sound defense policy requires the maintenance of a vigorous domestic mining industry. If the Defense Production Act is not extended, possibilities are that a new bill will be introduced to retain government authority to encourage exploration, development, and mining of strategic metals through long-term purchase commitments and subsidies. These have been DMPA functions under the 1950 Defense Law.

As a possible alternative to subsidies, which many in Congress and industry abhor because of accompanying government controls, bills are being drafted which would provide tax incentives for mining—by removing the $75,000 limitation on mining exploration costs as deductible items, and boosting the 15% depletion allowance for strategic metals to the 27½% enjoyed by oil and gas. The outlook is brighter for the former bill. These bills will be considered by the Ways and Means Committees.

Other bills of interest to mining that should come up within the next few months are: (1) a sliding metals tariff based on prices, (2) reorganization of the Federal Natural Resources Agencies.

Copper Outlook

NPA's Copper Division will tell the new defense mobilization officials that copper supply will come into balance with demand only when armaments production can be safely curtailed, the strategic stockpile objective is reached, or when the new copper mines start coming into production during 1954 and 1955.

Refined copper supplies will range from 125,000 tons to 135,000 tons a month during 1953, according to the NPA estimate. Excluding stockpile acquisitions, the potential demand will be about 138,000 tons a month—110,000 tons for civilian needs, 28,000 tons for military.

NPA's estimated 1953 supply, ranging from 1.5 million to 1.62 million tons, is slightly less than the 1.63-million ton annual supply available during the last two years. In 1951, the military take was about 12%; in 1952, about 30%. Imports totaled 494,000 tons in 1951; 580,000 tons in 1952.

Rep. Daniel A. Reed (N.Y.), chairman of the House Ways and Means Committee—in his report to the House, recommending extension of the copper tariff suspension said that copper demand during the first half of 1953 will be about 174,000 tons monthly, including the stockpile take. He estimated the monthly supply during this period at 90,000 tons of domestic copper and 50,000 tons of foreign copper.

Says the NPA Copper Division: If price controls are not retained after April 30 expiration, the flow of scrap and the output of refined copper from scrap will probably be enough to allow quick relaxation of copper distribution controls. But this assumes that stockpile acquisitions will not be very sizable.

The copper officials also estimate that 10,000 tons of additional foreign copper may be available each month for U. S. consumers if the European market remains soft.

OPS, in the meantime, has fired its final blast for retention of price controls. The agency predicted a price rise of 5 to 9¢ a lb. for domestic copper when and if controls are lifted.

Hanna Nickel

M. A. Hanna Co. is just about set with plans to build the first commercial U. S. ferro-nickel plant, near Riddle, Oregon, as a result of DMPA contracts signed with two Hanna subsidiaries last month. The deal will bring in production of at least 95-million lb. of nickel by 1962.

The government conceded that the operation was a marginal one, and extended a substantial subsidy. Hanna Coal and Ore Corp. will develop the mining property at a cost of $4.3-million; it has been granted 85% fast tax amortization. DMPA will buy the ore and resell it at cost to the Hanna Nickel Smelting Co.

Hanna Smelting has received a $24.8-million advance from DMPA for construction of a ferro-nickel plant. If Hanna is able to fulfill the commitment to produce at least 95-million lb. of contained nickel by 1962, $22-million of the advance will be written off. The remaining $2.8-million will be repaid only if Hanna wants to keep title to the plant after the contract's expiration date.

The price for the ore will be $6 per dry ton with nickel content of 1.5%; for the ferro-nickel ingot, not more than 79.39c. a lb. For the first 5-million lb. of nickel produced and 60.5¢ a lb. for the remaining tonnage.

DPA's nickel goal is a 190,000-ton supply in 1955, including stockpile needs. This will come almost entirely from imports, and is 89,000 tons more than the 1950 supply in the United States.

Excluding the new Hanna production, the defense mobilizers already have 113,000 tons of nickel in sight for 1955 with projected production schedules. Now they are dickering for about 25,000 additional tons with Falconbridge Nickel Mines, Ltd., Western Nickel Co., a new outfit, and a few other possibilities. DMPA signed a Hanna-type pact with Falconbridge last year.

Mining in 1952

The U. S. mining industry continued to operate at the highest production rate in history during 1952, according to the Bureau of Mines' year-end estimate. Total value of mineral production—including metals, fuels, and other nonmetallics—was $13.5-billion, the same as in 1951. (1949 value; $10.6-billion; 1950, $11.9-billion). Slight increases in average mineral prices compensated for a drop in physical volume of production.

Metals dropped to $1.6-billion last year from 1951's $1.7-billion. Nonmetallic minerals (excluding fuels) went up from $2-billion in 1951 to $2.2-billion in 1952. In the latter category, physical production of sand and gravel, stone, ground stone and sandstone, bromine, and potash rose most sharply. Fluorspar and gypsum output declined from the totals they made in 1951.

LABOR THIS MONTH

Joseph M. Gambatese, McGraw-Hill Washington News Bureau

WASHINGTON KEEPS EYE ON MINE-MILL: The new Congress isn't forgetting Communist influences in Mine, Mill and Smelter Workers now that the McCarran Internal Security Subcommittee has issued its report on Salt Lake City hearings. Some developments:

• Mine-Mill leaders who refused to tell the subcommittee whether they were Communists will be asked by the National Labor Relations Board to reaffirm the non-Communist oaths they have taken every year under Taft-Hartley. NLRB will also ask them to swear they have not been Communists or supported any Communist organization during the entire period they have been in compliance with Taft-Hartley.

This is the same action NLRB took against leaders of four other left-wing unions who refused to tell a New York grand jury whether the oaths they filed with NLRB were true. NLRB was urged to take this step against Mine-Mill, too, by Sen. Arthur V. Watkins (R., Utah), a subcommittee member who participated in the hearings. NLRB assured Watkins it would move against Mine-Mill leaders as soon as it's right to do so—challenged by the other unions—was upheld by the Federal District Court in Washington, where the unions sought an injunction against NLRB.

If they fail to comply, NLRB will declare Mine-Mill in noncompliance and dismiss all pending cases.

• The Red-hunting Internal Security Subcommittee will be continued under the new Senate Judiciary Committee chairman, Sen. William Langer (R., S. D.), but Sen. Pat McCarran (D., Nev.) won't be chairman. His successor may be Sen. William E. Jenner (R., Ind.) Langer is asking Congress for enough funds to keep the subcommittee going until next Jan. 31. The subcommittee staff has its eyes on Mine-Mill along the east coast and in New England.

• McCarran re-introduced his Commie-Control Bill on the second day of the new Congress. It is S.23, amending his Subversive Activities Control Act of 1950. The bill makes it unlawful for a Communist to hold an office or a job with a labor union and permits employers to discharge workers who are members of subversize organizations.

CIO SEEKS MINE SAFETY BILL: CIO Steelworkers want Congress to pass an enforceable mine safety law for metal mines like the one the last Congress enacted for coal mines. Steel union has shifted staff member Stephen Levitsky, a Phi Beta Kappa at Ohio U., to Washington, to work on this and other legislation. Bulky Frank N. (Norty) Hoffman, All-America tackle at Notre Dame under Knute Rockne, makes up the other half of the Steelworkers' legislative team in the Capital.

MINE-MILL STEPS UP SOUTHERN ORGANIZING: Pending wage negotiations in the mining industry next summer, Mine-Mill will concentrate on organizing southern workers. Propaganda will follow this line: unless southern workers are better organized, Republican Administration will ruin them; only Mine-Mill is politically independent enough to help them. Mine-Mill's Canadian branch will hold its fifth annual convention at Calgary, Alta, March 5-7. A permanent Canadian council will be formed.

TAFT IS STILL IN CONTROL OF TAFT-HARTLEY REVISION: Even though he is not chairman of the Senate Labor Committee, Sen. Robert A. Taft will still have most to say about how the labor law is repaired. He is Senate majority leader and chairman of the Labor Relations Subcommittee. The Labor Committee chairman, Sen. H. Alexander Smith (R., N. J.) is a Taft man, Rep. Samuel K. McConnell, Jr. (R., Pa.), shares most of Taft's views. The staff personnel who will handle the committee hearings and do a technical job with the amendments are close to the Taft crowd. Hearings begin this month. But they will drag out. Don't look for a Smith-McConnell act until summer.

PERSONAL NEWS

A. RUSSELL MERZ (left) and ALLEN H. ENGELHARDT (right) have been appointed vice presidents of Cerro de Pasco Corp., New York, N. Y. As vice president in charge of sales and purchases, Mr. Merz succeeds GEORGE P. SAWYER, who will continue as vice president of the company and handle general corporate matters. Mr. Engelhardt will continue to manage the company's metal mining, smelting, and refining operations in Peru, S. A., with headquarters at La Oroya, Peru.

E. M. Stiles has retired as chief engineer of The Consolidated Mining and Smelting Company of Canada, Ltd., Trail, B. C., to become consulting engineer, engineering division. **J. V. Rogers,** assistant chief engineer, has filled the position of manager of the engineering division. **W. K. Gwyer,** assistant superintendent of construction is assistant manager, engineering division. **E. Mason,** chief design engineer, will assume more responsibilities in the technical field.

J. F Wolff, Sr., who, since his retirement as general mining engineer for Oliver Iron Mining Division, has acted as engineering consultant for the company, is now a private consulting mining engineer and geologist, located in Duluth, Minn.

William Richards, formerly with Pickands, Mather & Co.'s engineering staff at the Biwabik mine and Zenith mine, Minnesota, is now with Western-Knapp Engineering Co.

J. Kenneth Godin, formerly mine superintendent of Belleterre Quebec Mines, Ltd., Belleterre, Que., and with the company for 15 years, has been appointed mine manager, succeeding **B. H. Budgeon,** resigned.

Sidney T. Keel, formerly domestic sales manager, rock phosphates, phosphate division, International Minerals & Chemical Corp., Chicago, Ill., has been promoted to sales manager of rock phosphates. **Robert L. Borg,** formerly division traffic manager of International's Florida phosphate operation, has been made northern district sales manager of the rock phosphates division.

Oscar Swanson, Deerwood, has been appointed head chemist at Lerch Brothers, Inc., in Crosby, Minn.

Stephen Roddman, with the Duluth, Minn., office of Oglebay, Norton & Co., has been transferred to Montreal, Wis., where he is supervisor of training and industrial relations for the Montreal Mining Co.

A. L. Irwin, purchasing agent, has been appointed manager of the purchasing division of The Consolidated Mining and Smelting Company of Canada, Ltd., Trail, B. C.

ALVIN H. ROSS, formerly research and development metallurgist with Canadian Industries Ltd., has been appointed assistant to the vice president and general manager of Climax Uranium Co., New York, N. Y.

Lendall P. Warriner, formerly president and general manager of Appalachian Minerals Co., Monticello, Ga., has joined Cyprus Mines Corp. as exploration engineer in the New York, N. Y., office.

Raymond F. Robinson, chief geologist for Sunshine Mining Co., Yakima, Wash., has resigned to join the U. S. Geological Surveys in the Tucson, Ariz., office.

Brinton C. Brown has left the U. S. Bureau of Mines at Tucson, Ariz., to join A. Soriano y Cia., Manila, P. I., as mining engineer.

Frank M. Estes has returned to his home in Memphis, Tenn., after a six months' professional trip to Colombia, S. A.

J. D. Crawford has been elected vice president and general manager of Alaskan operations and **C. G. Rice** vice president and general manager of oil operations for United States Smelting, Refining and Mining Co., Boston, Mass. Mr. Rice was also elected a member of the board to succeed **Samuel H. Marshall,** resigned.

Howard F. Keller, chief of the Base Metals Division of the Defense Minerals Exploration Administration, Washington, D. C., has resigned to become general superintendent of the Naica Unit of the Fresnillo Co. at Naica, Chihuahua, Mex.

Jay B. Ford, Jr., has been appointed assistant general manager of the United States Potash Co., New York, N. Y. Mr. Ford joined the company in 1947, at which time he was a captain in the Army Quartermaster Corps in Europe.

S. W. Enloe, Jr., Spruce Pine, N. C., has been appointed to represent the mining industry on the North Carolina State Board of Conservation and Development through May, 1955. Mr. Enloe succeeds **Dr. W. Locke Robinson** of Mars Hill, resigned.

W. S. Phillips has been appointed mine superintendent at the Chelan Division of Howe Sound Co., Holden, Wash. **J. M. Newman** is now chief engineer.

Alton Gabriel, technologist and administrator with the Bureau of Mines, U. S. Department of the Interior for more than 20 years, has been named acting regional director of the Bureau's Region VII, the Southeast. Dr. Gabriel replaces the late **Hewitt Wilson.**

Charles R. Cox, president of Kennecott Copper Corp., New York, N. Y., has been named chairman of the newly created Board for Development at New York University.

Harry J. Wolf, consulting mining engineer of New York, N. Y., has been in Greece examining iron and nickel ore deposits in Crete, in French Morocco investigating manganese, and in Portugal examining tungsten and uranium properties.

John J. Lennon, manager, scrap purchases, The American Metal Co., Ltd., has been appointed assistant manager of the company, Chicago, Ill. **H. F. Bittner,** formerly assistant manager, will join the head office in New York,

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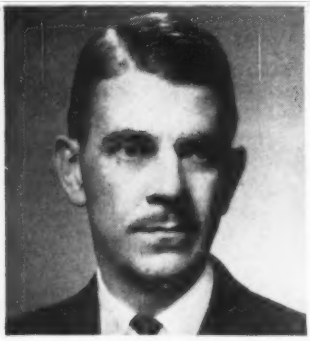

WESTON G. THOMAS (left), director and treasurer of Climax Molybdenum Co., New York, N. Y., has been elected vice president. LOUIS S. DEITZ, JR., for the past 23 years associated with Western Electric and its affiliate, Nassau Smelting & Refining Co., has been appointed technical adviser.

N. Y. **William R. Black,** formerly of the executive sales division, will succeed Mr. Lennon as manager, scrap purchasing.

Robert C. Stephenson, assistant state geologist of Pennsylvania, has resigned to join the mineral division of Woodward & Dickerson, Inc., Philadelphia.

At San Manuel Copper Corp., Superior, Ariz., **F. H. Buchella** is now plant manager and director of engineering; **J. F. Buchanan,** mine superintendent of Magma Copper Co., is mine manager; **C. L. Pillar** is development superintendent; and **H. I. Ashby,** resident engineer, is now general foreman.

Frank G. Sarver, purchasing agent, has been appointed assistant to the vice president and general manager of Magma Copper Co. and San Manuel Copper Corp., Superior, Ariz. **R. L. Medlock,** assistant purchasing agent, will succeed Mr. Sarver as purchasing agent.

C. B. Foraker, acting mine superintendent, has been appointed mine superintendent, Magma Copper Co., Superior, Ariz.

T. P. Trask, assistant chief electrician, has been promoted to chief electrician, Magma Copper Co., Superior, Ariz. **Elmer Mathews** is now chief electrical foreman.

Dr. A. F. Banfield and **Dr. Roland D. Parks** of Behre Dolbear & Co., New York, N. Y., have been doing professional work at Cobalt, Ont., Can. Associated in the work is **Dr. Elwood Moore. Parke A. Hodges** and **Ross Field** of the company are making a mine examination at Huepac, Sonora, Mex.

Dr. Charles H. Behre, Jr., Dr. A. F. Banfield, David St. Clair and **Captain Guillermo Bixby** of Behre Dolbear & Co., New York, N. Y., have been in the Galapagos Islands making a geological reconnaissance of Isabela Island.

C. M. Sampson has been appointed general superintendent of operations for Garden Island Bay and Bay Ste. Elaine, Freeport Sulphur Co., Port Sulphur, La. **R. H. Feierabend** is general superintendent of operations, Grande Ecaille operations. **J. E. Monroe** has succeeded Mr. Feierabend as production superintendent of Grande Ecaille. **W. S. Donner** has succeeded Mr. Sampson as production superintendent at Bay Ste. Elaine.

J. H. Thompson has been named president of Iron Ore Co. of Canada to fill the vacancy caused by the appointment of G. M. Humphrey as Secretary of the Treasury. Mr. Thompson is also chairman of the board of Hanna Coal and Ore Corp.

WILLIAM J. F. FRANCIS (above) has been appointed general sales manager, western, American Potash & Chemical Corp., Los Angeles, Calif., Mr. Francis succeeds DAVID B. SCOTT who has retired after 18 years in the post.

H. R. Banks, superintendent of the Sullivan concentrator of Consolidated Mining and Smelting Co. of Canada, Ltd., at Kimberly, B. C., has been appointed consulting engineer, ore concentration, **A. G. Robertson,** special assistant to the manager of the metallurgical division succeeds Mr. Banks.

E. R. Lovell, president, has stated that Calumet and Hecla, Inc., formerly Calumet and Hecla Consolidated Copper Co., is establishing its executive offices in Chicago, Ill.

Henning Marstrander, U. S. Bureau of Mines engineer, has been sent to India for two years as technical adviser to the Indian Government.

Richard F. Moe, former general superintendent with St. Louis Smelting & Refining Co., is now mine superintendent at White Pine Copper Co.'s operations in Ontonagan County, Mich.

Cecil Fitch, Jr., vice president and general manager, Chief Consolidated Mining Co., Eureka, Utah, was elected president of the Utah Mining Association, Salt Lake City. Mr. Fitch succeeds **W. G. Rouillard,** manager, Garfield plant, American Smelting & Refining Co. **J. Parnell Caulfield,** assistant to the general manager, western mining divisions, Kennecott Copper Corp., was advanced from second to first vice president. **Otto Herres,** vice president of Combined Metals Reduction Co., was elected second vice president. Re-elected were: **A. G. Mackenzie,** vice president and consultant; **Miles P. Romney,** secretary-manager; and **Walter M. Horne,** assistant manager.

Louis Buchman, Salt Lake City, Utah, vice president and director of Kennecott Copper Corp. and general manager of its mining operations in the United States, has retired after 39 years of service to Kennecott and its predecessor, Utah Copper Co. General manager of the Utah Copper Division, Kennecott, since Jan., 1949, Mr. Buchman was appointed general manager of all western mining divisions in September. He was elected vice president and director in Jan., 1952.

E. W. Englemann, general manager of the Utah Copper Division, Kennecott Copper Co., Salt Lake City, has retired after 42 years with Utah Copper Co. and Kennecott. General superintendent of mills at Arthur and Magna in 1938, he was named general manager of the division in 1949.

J. Fred Johnson, manager of operations, western mining department, American Smelting and Refining Co., Salt Lake City, Utah, has retired after 30 years with the company. Mr. Johnson came to AS&R from Chief Consolidated Mining Co., becoming manager of operations in 1946. **F. V. Richard,** former manager of the southwest division of AS&R's western mining department, Tucson, Ariz., will succeed him.

Harold Larsen has been appointed assistant to the manager of the nickel sales department of The International Nickel Co., Inc., New York, N. Y. Assistant section head in the distributors' sales section, nickel sales department, Mr. Larsen has recently been with the National Production Authority, Wahington, D. C., as chief of the nickel section of the Iron and Steel Division.

Dr. A. R. Ledoux has announced that Ledoux & Company of New York has moved to new laboratories at 359 Alfred Ave., Teaneck, N. J.

W. A. Del Mar, chairman of research and development committee of Phelps Dodge Copper Products Corp. and chief engineer of Habirshaw Cable & Wire Division of the company, New York, N. Y. has returned from London, Eng. Mr. Del Mar received the Fellowship of the City and Guilds of London Institute for "outstanding contributions to the industry." The diploma was presented by Prince Philip, Duke of Edinburgh.

Roger O. Oscarson, Spokane, Wash., formerly economist for the War Production Board and one-time president of the Northwest Mining Association, has been named mineral economist for the Bureau of Land Management's Division of Minerals.

Jesus Carrasco V has resigned as secretary general of the Mexican miners union, citing ill health as the reason. Luis Quiroz Islas is his successor.

Robert T. C. Rasmussen, Bureau of Mines' metallurgist at the electrodevelopment laboratory at Albany, Ore., has joined Quebec Metallurgical Industries, Ltd., Ottawa, Ont., Can.

William Knowles has retired as works manager of the El Paso, Texas copper refinery, Phelps Dodge Refining Corp. **Earl W. Donahue**, assistant works manager has succeeded Mr. Knowles and **B. B. Kunkle** has been appointed assistant works manager.

Melvin Viant, Nashwauk, Minn., has been appointed assistant superintendent of construction for the Cleveland Cliffs Iron Co.'s Mesabi Range operations.

Paul Swanson, Nashwauk, Minn., superintendent at the Hawkins mine, has been transferred to the Cleveland Cliffs Iron Co.'s Sargent mine at Keewatin as superintendent. **William Le Clair**, Nashwauk, is now assistant superintendent at the Hawkins mine.

Seven men have been given life memberships in the Northwest Mining Association in recognition for long and important service to the mineral industry. They are: **Stanley A. Easton**, Coeur d'Alene, Idaho, president of Bunker Hill & Sullivan Mining and Concentrating Co.; **Lewis P. Larsen**, Spokane, Wash., president of Pend Oreille Mines and Metals Co.; **Joseph Moris**, Spokane, one of the original discoverers of the Rossland, B. C., mining camp and the LeRoi mine; **Charles P. Robbins**, Spokane, for many years treasurer of the NMA and active in development of Republic, Wash. gold camp; **W. S. Norman**, Spokane, mining pioneer in the Northwest and Canada; **Frank M. Rothrock**, Spokane, pioneer in the Coeur d'Alenes and only remaining original partner of the Hercules; **Frank Woodside**, for many years secretary of the British Columbia Chamber of Mines, Vancouver, B. C.

James Clemens has rejoined the M. A. Hanna Co. engineering force at Iron River, Mich., after location in the Rocky Mountain states for two years.

OBITUARIES

Walter L. Maxson, vice president—research for the Oliver Iron Mining Division of United States Steel Corp., passed away on Jan. 8 in Bellingham, Wash. A graduate of Cornell and a member of the Atomic Energy Commission as consultant on the raw materials committee, Mr. Maxson was a prominent leader in taconite research.

Paul Norton, 60, business manager of Tennessee Copper Co., Copperhill, Tenn., died Dec. 18. He had been with the company 20 years.

Franklin E. Turton, vice president and director of Braden Copper Co., Kennecott Copper Corp. subsidiary, died Dec. 21 in Coya, Chile. A graduate of the College of the Pacific, University of California, Mr. Turton had been with the company for 39 years. A director since 1946, he was elected general manager in 1944 and vice president in 1951.

Francis A. Bell, vice president of Cleveland-Cliffs Iron Co., Cleveland, Ohio, passed away Dec. 15. A graduate of the University of Michigan, Mr. Bell joined Cleveland-Cliffs in 1952, coming from the law firm of Berg & Clancey.

Jesse H. Steinmesch, 70, vice president of Minerva Oil Co. died on Dec. 15 in Eldorado, Ill. A graduate of Missouri School of Mines and Metallurgy, Mr. Steinmesch also served as professor of mining and metallurgy there.

Edwin E. Littler, Upper Montclair, N. J., who retired in 1947 as purchasing agent for Anaconda Copper Mining Co., New York, N. Y., passed away Dec. 14. Mr. Littler joined Anaconda in 1891 as bookkeeper, rising to purchasing agent in 1925.

Joseph C. Rovensky, 66, chairman of the Patino tin mining enterprises and former vice president of the Chase National Bank in charge of international banking, died Dec. 17 in New York, N. Y.

Alpheus F. Williams, United States-born former general manager of De Beers Consolidated Mines, Ltd., died Jan. 6 near Capetown, South Africa, at the age of 77.

Arthur Charles Bishop, 73, passed away in Lakewood, Ohio, on Jan. 1. Mr. Bishop, who joined Oglebay, Norton & Co. in 1897, retired in 1949 as secretary and stockholder, retaining his post as director.

John Redington died at 80 near Timmins, Ont., on Jan. 1. Mr. Redington, born in England, entered the mining field at 14. He retired in 1947 as general manager of Coniaurum Mines.

Earle William Berry, 51, passed away Nov. 23 in San Francisco, Calif. Mr. Berry, professional engineer, has worked in the Philippines for Benguet Consolidated, in Montana, California, Nevada, and in Turkey for the government; also in Guatemala for Compania Minera de Guatemala and for the past several months, he has been in Alaska for the MSTS.

F. R. Wolfle, 70, of Denver, Colo., passed away. Mr. Wolfle was president and manager of the Florida Mining Co. and former president and manager of the old Florence silver mine near Nelson, B. C.

Hewitt Wilson, 61, died on Nov. 25 in Fullerton, Calif. Mr. Wilson was a former professor at the University of Washington College of Mines and southeastern regional director of the U. S. Bureau of Mines.

LETTERS RECEIVED

Dear Mr. Ramsey:

The article entitled "New Acid-Leaching Section Raises Cyprus Copper Recovery by 10%," published in the Dec., 1952, issue of *E&MJ*, gives description of acid production under the name of the "Keyes Autoxidation Process." Inasmuch as no process background information was given in this article, the undersigned believes it is necessary in order to clarify this acid process development.

Investigations of the U. S. Bureau of Mines, largely at Tucson, Ariz., covering the period of about 1922 to 1930, provided the background for a simplified method of producing sulphuric acid and ferric sulphate intended for copper ore leaching. This autoxidation process was accomplished by combining sulphur dioxide and air with dilute ferrous sulphate solution. Difficulties in finding suitable equipment retarded acceptance of the process for many years.

The work of the Bureau of Mines in establishing certain fundamentals and demonstrating on pilot scale was completed about 1930. Since then the undersigned has continued privately the development and commercial application of the process, embracing several different projects. These subsequent developments resulted in various improvements in handling SO_2 gas, together with obtaining more effective action in SO_2 conversion.

Further development of improvements in autoxidation were conducted at the City of Phoenix sanitation plants, by the undersigned, with result that the process was adapted to iron sulphate production. It was incorporated into the plant operations by Dario Travaini, superintendent of water and sewage treatment. This enabled the demonstration of performance applied to acid production; Cyprus testing was an outstanding example.

It would be appropriate to refer to my contributions in this field as the "Keyes Improved Autoxidation Process."

HARMON E. KEYES
Consulting Manager
Phoenix, Ariz.

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THE BLASTER

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In rock-drilling operations, the blaster is a key man. He plans the blast, tells the drill-runners where to drill their holes, loads the charge for the greatest effectiveness.

He expects . . . and gets . . . peak efficiency from his men and the tools they use.

This is why Crucible Hollow Drill Rods rank first with crews supervised by top-notch blasters. Experience has shown them that Crucible rods stand the rapid-fire battering of modern rock-drilling longer; give them the least breakage, the greatest service life.

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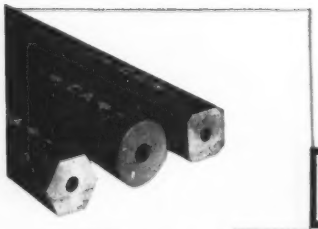

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E & M J

NEW PRODUCTS DIGEST

For further information on these products, circle item numbers on card—insert and mail.

New Equipment in 1952

IF you have taken more than a sweeping glance at the contents of the preceding pages in this issue, you must be fully aware that 1952 was a big year in the mining industry. It was a big year, too, for the men who manufacture mining, milling and metallurgical equipment. At least requests for information on new products appearing in *E&MJ* reached a record high. So in addition to bringing you the regular New Products Digest, we are including a review of the year in equipment with 12 pages of items that aroused great interest with *E&MJ* readers as reflected by their requests for additional information.

The regular NPD is also unique this month in that we are devoting most of our regular space to a new combination mining machine invented by Dale Hayes of American Zinc, Lead and Refining Co., at the Grandview mine. Meet the "gismo" on p. 148.

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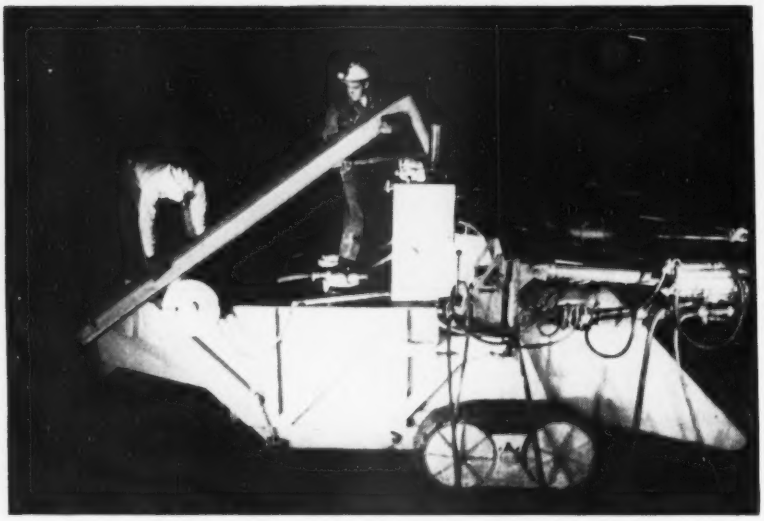


TRAVELING BEAM is temporarily placed on gismo for hoist to pick up drilling boom and jib.

Drilling

MOUNTING BOOM on bracket and converting unit from loader to jumbo takes only a few minutes.

Gismo Multiplies Miners' Output

AT THE GRANDVIEW MINE of American Lead, Zinc and Smelting Co., Metaline Falls, Wash., a mechanized ore production system has been developed which is raising daily output from 15 to 100 tons per man. This system is organized around a newly developed machine which the inventor, Dale Hayes, calls a "self-loading transport—really a self-loading shuttle car or a self-loading dump truck." More often, the device is called a "Gizmo" by the miners and is known better by that name. It combines three distinct functions in stoping; drilling blast holes, loading ore and hauling. In addition, the first cost of this equipment assembly is much less than the new cost of the many standard equipment units it replaces. A written comment received recently stated "there ain't no such animal."

During Nov., 1952, the gismo in use at the Grandview mine produced an average of 639 tons per day with six men, three on a shift. The three-man crew consisted of an operator plus two miners operating three rock drills from a stope-drilling jumbo (actually the gismo converted into such a jumbo). Conversion can be made in a few minutes. The mining operation performed by these six men consists of the drilling of the ore in the solid so that it can be broken, loading the broken ore, and transporting it to a point usually within 300 to 400 ft. of the face to conventional transportation facilities. During Nov., 1952, this system produced more than 100 tons per production man for the entire mining or stoping operation delivered to the regular transportation system, compared with 15 tons per man production shift using the former method of doing the same job with first-class modern equipment. The older method used the same rock drills but substituted slusher loading and transport, and had necessarily a much shorter transportation distance. The gismo can reduce labor about one-fifth to one-tenth of that required in conventional methods, depending on physical conditions.

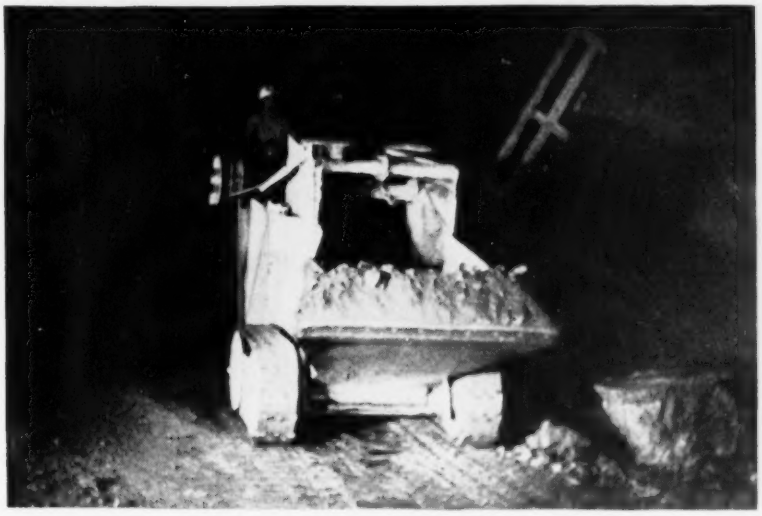
How They Started

The new Grandview system as it is now organized has been in use for more than 11 months and has produced 106,000 tons plus consuming about 2,500 hours of tractor diesel power unit operation. The equipment was put to work underground initially in a space barely large enough to get it in and protect it from the blasting. Since that time the gismo has excavated its own working area and room from very cramped conditions to the present situation where it serves generally more than six headings. The mine in which it operates normally produces 835 tons per day.

Table II gives production figures. The escalator of increase in the percentage of the total mine production turned out from month to month can be accounted for by the machine gradually enlarging its working room and working space. Increase in tons per man is due to increase in working space, plus better use of equipment and better organization of work as experience was acquired.

Equipment used consists of two self-loading transports, both convertible into either a two- or three-drill stope jumbo in a few minutes, and a HD-5 Allis-Chalmers diesel tractor modified for underground use and for this particular application. As a stope-drilling jumbo the gismo uses two or three detachable, long-radius hydraulic jibs, plus 3½-in. rock drills on a chain-back type of mounting. The entire drill and jib mounting and hose assembly is attached on or detached from the gismo in one piece by a removable portable crane on the gismo.

The gismo proper is very simple in



LOAD OF 4½ TONS is carried from stopes to main haulage, approximately 400 ft., up grades as steep as 12%.

Hauling

BOTTOM DUMP is used at Grandview, but gismo can be rigged for loading into trucks without difficulty.

function and in design and construction. The loading principle employed is controllable to the extent that it will do all the things at the foot of a blasted muck pile that can be accomplished by a man with a hand shovel. For example, the gismo will load at the feather edge of a blasted muck pile, no matter whether the muck is a few inches thick or several feet thick. It cleans up the fly rock and makes its own roadway. It loads from a rough muck pile, a tightly-packed fine muck pile, or it will load very large boulders and deposit them in a stockpile for subsequent block-holing and blasting.

The machine used at the Grandview mine has a transport capacity of about 4½ tons. Size of the machine and the tractor assembly was limited so that it would pass through all mine openings, none of which was planned for large equipment. This equipment was sent into the mine via a long adit tunnel, down a 23-deg. incline shaft, through a long crosscut and into its initial place of work on its own power.

A great advantage in using the gismo is its ability to be modified through a great range of sizes, as to width, height, and length. The Grandview unit will work satisfactorily in a heading about 9½x9½ ft. It has excavated cross sections about 40x50 ft. and it could excavate larger sections.

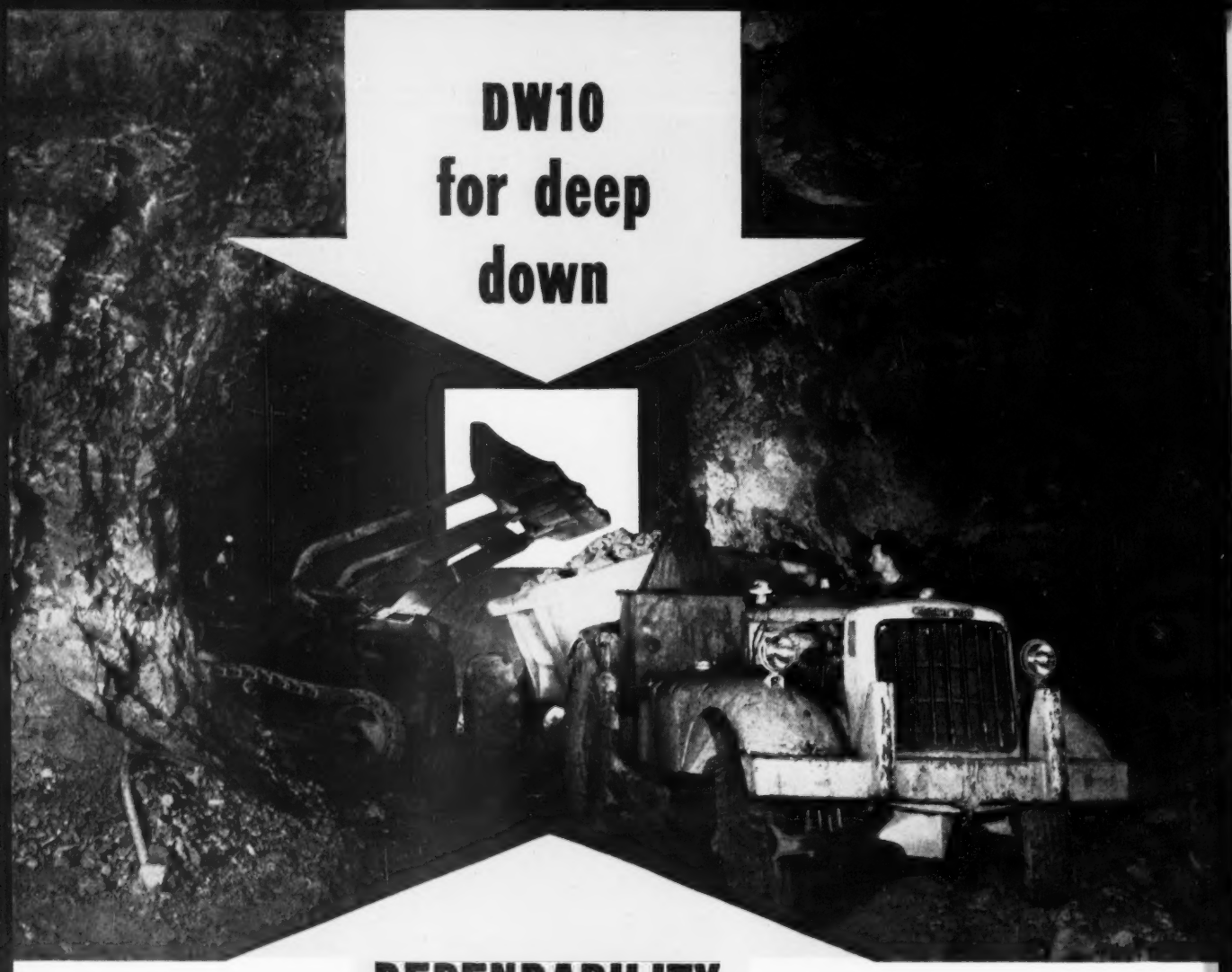
Power is applied by a standard winch controlled with a clutch and an automatic brake and attached to the power take-off of the tractor. Transport and crowding power can be applied in any normal way and requires a speed change transmission and reverse such as is normal in a tractor or truck. Parts in the gismo used at the Grandview mine were made in a general fabricating and machine shop in Spokane, Wash. A small amount of machining is required, none of which is precision work. The simplicity of the design and the mechanical functions permit sturdy construction, requiring a minimum of maintenance and making possible a very high work factor. Most maintenance time and expense is involved in the tractor, the power application unit, a machine requiring precision parts. These parts, however, are standard and readily available. The tractor in use at Grandview is particularly adapted to our service and its operation has been quite satisfactory; however, the standard tractor could be improved to better withstand severe underground service.

Flexibility Is The Key

Simplicity and great flexibility of the gismo assembly as to size and shape will give the machine a wide surface application. For these reasons, too, it is so well adapted to mining. It has a great loading capacity for its cross-sectional size. For example, the machine which loads and transports 4½ tons can be taken through a 6x6-ft. mine opening, and it could be designed to operate with 6 ft. of head room. The unit described required about 9 ft. of operating head room. Capacity can be modified by adjusting width, height, and length. That is, one can modify in three dimensions or in one to accomplish space limitations without disturbing normal functions and effectiveness.

Adaptation of this mechanized system to the Grandview mine required no alteration or modification to any equipment or method already in use at the mine except the stoping operation. The stoping method in itself is now completely changed but the gismo dumps into the same facilities formerly used as mill holes for the slusher operations.

Elevation of pivots on the folding parts of the gismo can be changed, one with reference to the other, so that the machine will load a transport compartment at a higher elevation to permit end dumping, such as used for dump trucks, provided sufficient head room is available. As built, the equipment assembly is adapted to relatively flat grades and relatively short transport distances. The transport distance limitations would be comparable to the usual limitations for trackless transport distances. The Grandview mine limits the trackless transport to the stopes and assumes that the normal rail car haulage is the cheapest transportation for long hauls, and that



DEPENDABILITY

In mining, like any other business, speed means money. That's why a tough, tireless Caterpillar DW10 speeds a W10 Wagon along the rough underground roads of the Netta Mine, operated by Eagle-Picher Co. in Cardin, Okla.

Three times each hour, this swift team lugs 15 tons of lead and zinc ore over a haul distance of 3½ miles! Every hour 45 tons of ore are delivered to the shaft where it is hauled to the surface.

At the drilling area, a busy Caterpillar HT4 Shovel fills the wagon's yawning, big-capacity bowl.

Under rugged conditions, this rough-and-ready big yellow team produces for Eagle-Picher Co. It's expected to. Tractors, wagons, and shovel are all Caterpillar-built – every part designed for rough work. Cat Diesel Tractors never sputter and die with heavy loads in rough going because tenacious lugging characteristics are engineered and built into them.

This equipment is built to work long and hard. You can keep it up to Cat standards by insisting on genuine Caterpillar parts. The nearby Caterpillar Dealer who sells you the equipment will give you quick, expert service.

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EARTHMOVING EQUIPMENT

For Your Files

This informative manufacturers' literature is free unless otherwise specified. To obtain bulletins circle their numbers on card below and mail.

STEEL SHELVING. Here are 32 pages of equipment which should be suggestive of lots of ideas to improve your warehousing or storage problems. Precision Equipment Co., Chicago, Ill. (37)

PUMPS. Illustrative and informative folder contains descriptions and suggested application for nine different Nagle centrifugal pumps for abusive industrial applications. Bulletin No. 952 is available from Nagle Pumps Inc., Chicago Heights, Ill. (38)

MANAGEMENT. "Requirements of Good Management" is a four-page folder covering "What makes a good executive," "Important management traits," and "What is good management." Folder (117-35) is available from Harold F. Howard Co., Detroit, Mich. (39)

ELECTRIC MOTORS. Bulletin No. 1784 gives U. S. Electrical Motors Inc. (Milford, Conn.) a chance to talk about their totally enclosed motors for dangerous, damp and dusty locations. They have done a beautiful illustration job. (40)

HYDRAULIC DRIVE. The latest issue of "Production Road," put out by Twin Disc Clutch Co., Racine, Wisc., constitutes a highly lucid primer in torque converters and fluid drive. If you want to know what hydraulic drive is all about, you'll get the answers here. (41)

V-BELTS. This eight-page catalog on V-belts offers simplified conversion tables for you to determine painlessly the size of Thermoid belts to replace your present make. Prices, weights, dimensions and construction details are also given. Thermoid Co., Trenton, N. J. (42)

For Executives, Present and Future

Most companies don't know how to use engineers. A recent study of 500 companies employing 106,000 engineers revealed this fact all too plainly. In an effort to do something about it, the National Society of Professional Engineers has published a 55-page booklet, "How To Improve the Utilization of Engineering Manpower." This booklet shows you, step by step, how to go about getting more mileage out of your engineering staff. You can get a copy for $2. by writing to the society at 1121 Fifteenth St., Northwest, Washington 5, D. C.

PILLOW BLOCK. Complete with cutaway views in color and engineering data, bulletin A-620 of Dodge Mfg. Co., Mishawaka, Ind., tell all about the All-Steel Dodge-Timken pillow block in sizes ranging from 2 15/16 in. to 10 in. (43)

PROTECTIVE COATING. "Where to Use Coal Tar Protection" not only gives you the information the title indicates, but introduces you to a handy way to apply the coating—by tape. All you have to do is roll Tapecoat on. Tapecoat Co., Evanston, Ill. (44)

MORE STORAGE SPACE. "There's an Angle to Increasing Existing Storage Space" is the coy title of a six-page illustrated report that shows how you can increase storage capacity by oblique stacking. There are even charts and formulas to help you select the right angle. Baker-Raulang Co., Cleveland, O. (45)

PROTECTIVE COATINGS. Pittsburgh Coke & Chemical Co. has prepared a series of five bulletins describing the firm's Pitt Chem 100 series of tar base protective coatings. One bulletin gives specifications, uses, and methods of applying all four coatings in the series. (46)

BRAKES. This eight-page descriptive brochure lists some of the many varied applications of Goodyear airplane-type disc brakes. Of special interest is their use on mine shuttle cars and mine loading machines. Goodyear Tire and Rubber Co., Akron, Ohio. (47)

THICKNESS TESTER. The Audigage uses an ultrasonic resonance method of testing wall thickness of such things as pressure vessels, boilers, gas cylinder, pipe, etc, from only one side. Such testing is easily done by one man. Circle 48 on the card below to get the salient facts on the Audigage from Branson Instruments Inc., Stamford, Conn. (48)

SHOVEL-CRANES. Some 24 well illustrated are hereby available to convince you of the advantages of using the 51 series Link-Belt Speeder shovel-cranes with Speed-O-Matic controls. Link-Belt Speeder Corp., Cedar Rapids,, Iowa. (49)

CHAINS. Campell Chain Co., offers a new catalog with illustrations, specifications, and other data on the various types of commercial and tire chains made by the company. Besides charts to show working load limits, the catalog has details about slings, hooks, and repair links. (50)

WATER POWER. If you contemplate putting in a small power plant on a small stream, Pamphlet "A" is some-

USE THIS CONVENIENT CARD

to obtain further information on products and bulletins mentioned in the New Products Digest. Circle item numbers, tear out and mail.

Not good after April 1, 1953, if mailed in the U. S. or Canada.

Engineering and Mining Journal—February, 1953

NOT GOOD AFTER APRIL 1, 1953—If mailed in U. S. or Canada.

Please send me the catalogs or further information about the items from New Products Digest whose numbers are circled.

1	8	15	34	41	48	55	62
2	9	16	35	42	49	56	63
3	10	17	36	43	50	57	64
4	11	18	37	44	51	58	65
5	12	19	38	45	52	59	66
6	13	20	39	46	53	60	67
7	14	21	40	47	54	61	68

My Name ..... Position .....

Company .....

Address .....

thing you ought to read. Issued by James Leffel & Co., Springfield, Ohio., it contains a lot of useful information for designing such a plant and tells you about the Leffel turbines for such installations. (51)

HIGH TEMPERATURE LUBRICATION. How "dag" colloidal graphite has been successfully used to lubricate kiln cars at, 450 deg. F., over conveyors up to 1200 deg. F. and forging dies at over 2000 deg. F., is described in an illustrated bulletin issued by Acheson Colloids Co., Port Huron, Mich. (52)

CONTROL VALVES. Ross Operating Valve Co., Detroit, Mich., has published an attractive bulletin, well illustrated, and full of reasons why you should use air for power and Ross valves for control. (53)

SPEED REDUCERS. "Shaft-King" shaft mounted speed-reduction units are illustrated and described in a 20-page speed reduction drive catalog. Includes dimensions and instructions on how to select the correct size unit for a given application. American Pulley Co., Philadelphia, Pa. (54)

TRACKMOBILE. Here's an illustrated report from Whiting Corp., Harvey, Ill., to tell and show you how the Trackmobile (it operates on both land and rail) has been helping out at various plants throughout the country. (55)

PLASTIC PARTS. G-E custom-molded nylon plastic parts are described in bulletin No. CDP-654 issued by General Electric Co., Pittsfield, Mass. Many applications and design possibilities are suggested. Tables show mechanical, electrical, thermal, and other properties of molded nylon plastics. (56)

DRILL BITS. A Liddicoat Drill Bit Booklet illustrates the advantages of this type bit. Featured are the type L bits for easy-to-drill ground and type H for strong rock and abrasive ground. Calumet & Hecla, Inc., Calumet, Mich. (57)

For Easier Pushing and Pulling

A 48-page "Handbook of Manual Materials Handling Equipment" has just been published by the Caster and Floor Truck Manufacturers' Association. Besides telling you just what types of equipment are available in industrial wheels, caster, two-wheel hand trucks, industrial platform trucks and trailers, and pallets and skids, this book is packed with suggestions and recommendations from the men who ought to know. Copies can be obtained from the association by writing to them at 27 East Monroe St., Chicago, 3 Ill. Price per copy is $1.

AMPCOFLEX. Ampcoflex is a self-supporting material for corrosion proof construction, a rigid polyvinyl chloride. Atlas Mineral Products Co., the manufacturer, claims distinct ad-advantages for the material in construction of flumes, ducts, tanks, etc., handling corrosive gas and liquid. (58)

RUST PREVENTIVES. This general catalog from Rust-Oleum Corp., Evanston, Ill., devotes 16 pages to showing how Rust-Oleum stops rust throughout industry. Besides 73 color chips of company products, there are complete instructions for surface preparation and application of the products. (59)

LEVEL CONTROL. Brochure No. F-101 describes the Fielden Tektor electronic level control for liquids, granular and bulky solids. Fielden Instrument Div., Philadelphia, Pa. (60)

JAW CRUSHERS. Smith Engineering Works, Milwaukee, Wisc., manufactures Telsmith jaw crushers in nine sizes from 10x16-in. to 30x42-in. Bulletin 280, with charts and illustrations, gives you a lot of pertinent information about them. (61)

BELT CONVEYORS. The foreword of this excellent catalog tells the story. "This catalog is virtually a handbook on the subject of belt conveyors. The information given within its covers is the outgrowth of nearly 50 years of experience. . ." Tables, drawings and darn good advice on conveyor installations make this book indispensable for the engineer. (62)

ELECTRONIC TRACK SCALES. Electronic scales for motion and stationary weighing of freight cars are described and illustrated in this catalog from Cox and Stevens Aircraft Corp., Mineola, N. Y. Data is given on accuracies, installation, operation and maintenance. (63)

SPEED REDUCERS. A 35-page catalog on right-angle speed reducers, spiral, bevel and helical gear-types, is offered by Western Gear Works, Seattle, Wash., manufacturers of Pacific-Western geared products. Bulletin 5203 has information to help you select the proper speed reducer for any job plus complete lubrication specifications. (64)

SPRAYWELDING. This bulletin describes and illustrates latest developments in Spraywelding equipment and techniques that enable powdered Colmonoy hard facing alloys to be fusion-bonded to metal parts by a three-step process to provide non-porous, wear, heat, erosion and corrosion resistant surfaces. Wall - Colmonoy Corp., Detroit, Mich. (65)

PUMPS. Construction features of supporting adapter-type, close-coupled general purpose pump in capacities to 2500 gpm. at heads to 550 ft. are described and shown in a new bulletin, 52B6083A, available from Allis-Chalmers Mfg. Co., Milwaukee, Wisc. (66)

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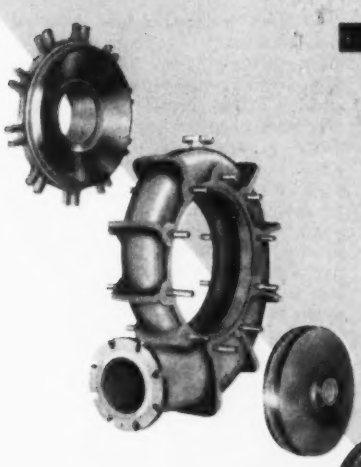
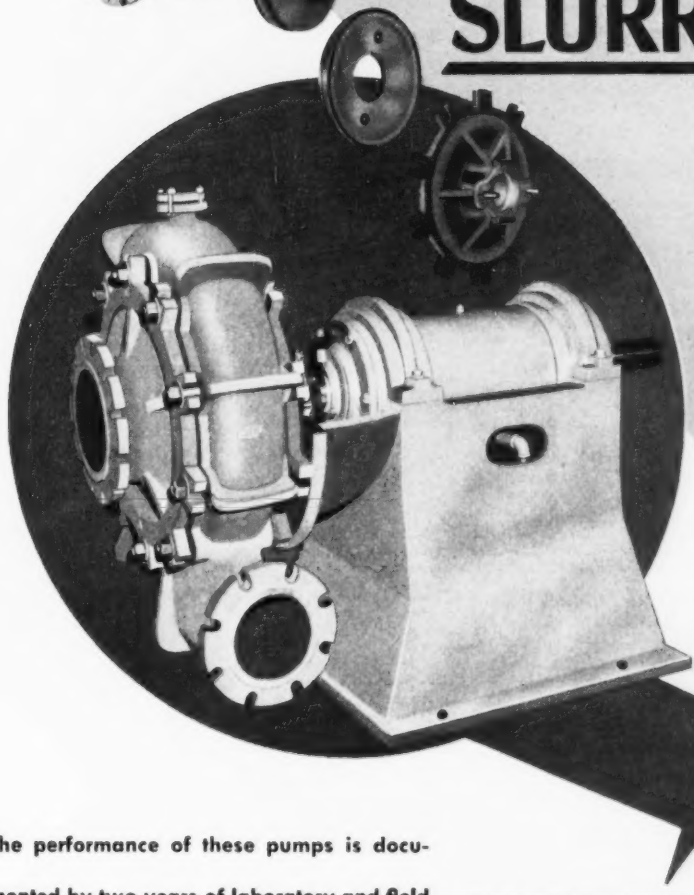
THE NEW GIW SLURRY PUMPS





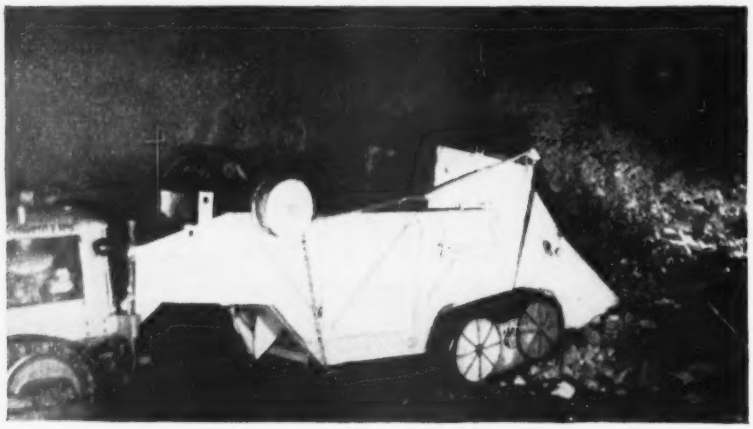
The pumping of finely divided, highly abrasive solids has become a major problem in the mining world. It is also often desirable to pump these slurries at high solid concentrations and over a wide range of heads and capacities.

Recognition of these circumstances has led Georgia Iron Works Co. to design a completely new line of pumps for the job.

The performance of these pumps is documented by two years of laboratory and field investigations. Their capacities range from 50 to 8000 GPM against heads up to 150'.

Write for our illustrated booklet describing the Slurry Pumps. We solicit your inquiry and if you wish, there is a representative near you who will call.

GEORGIA IRON WORKS CO.
EST. 1891
AUGUSTA GEORGIA



GISMO CAN LOAD from thin edge through muck pile to clean-up without special set-up arrangements.

Loading

BOULDERS are picked up easily. (This one's 2 tons.) Machine can also dig above and below grade.

TABLE I—What the Gismo Can Do

(Without the assistance of other machines and workmen)

1. Build its own road as the mining face advances.
2. Maintain transport roads to the dump stations.
3. Loads equally well from the thin edge of a blasted muck pile and through it to the final cleanup without preliminaries or setup arrangements.
4. Dispose of oversize boulders encountered in the muck to a stockpile for subsequent blasting.
5. Operator has complete control of digging level. Can dig at, below or above grade and can build and change roadway grade up or down abruptly or up over a muck pile.
6. Clean up face completely and digs below grade so drill Jumbo can collar lifter holes without delay and as easily as collaring breast holes.
7. Maneuver rapidly through small openings with sharp turns or function normally in right-angle offset headings.
8. Permit mixing of high grade-low grade control, such as two loads from face A, three loads from face B, and one load from face C, then repeat. Require no setup for loading from any point and will clean up its own road to that point on the first trip if so needed.
9. Clean up for re-blasting rounds which have created irregular face conditions because of missed holes.

trackless haulage is best adapted to non-permanent haulage ways and roadway conditions that cannot be kept within necessary rail haulage grades. The diesel-operated gismo has been used successfully on up and down grades of a little more than 12%. It could operate successfully at steeper grades with a heavier tractor so that sufficient net drawbar pull or push would be available on steeper grades for crowding to load the dipper. Grade limitations are not known but it is suspected that it would be about 20%.

Minimum Ventilation

One of the problems usually connected with dieselized mechanization underground is ventilation. The gismo requires the use of one 50-hp. diesel engine. Most state mining codes require a minimum of 75 cfm of fresh air for each bhp of diesel equipment, which in this case would amount to 3,700 cfm. Other types of dieselized equipment very often require in excess of 290 hp. of diesel in several units to get out the same amount of tonnage, in which case the ventilation requirements would be greatly increased.

From a psychological standpoint the gismo has largely overcome a natural resistance on the part of workmen and supervisors against using something new or doing things a different way. The success attained the new system is due to equipment performance, and the fact that its simplicity and adaptability has sold itself to the men who use it. The men are continually devising ways and means of making improvements and increasing the production rate of the machine.

Basic patents in the U. S. and Canada and in several foreign countries have been secured.

For further information on this amazing device, circle No. 1 on the postage-free reply card opposite page 150.

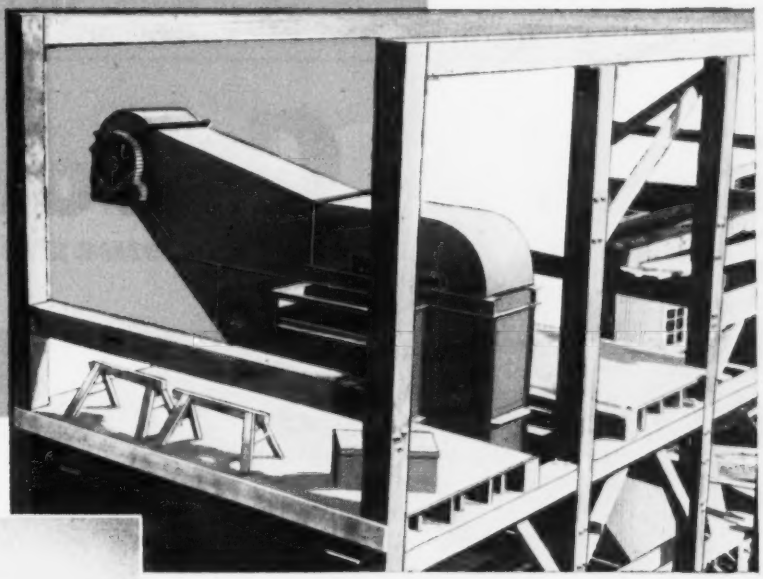
TABLE II—Productivity of the Gismo

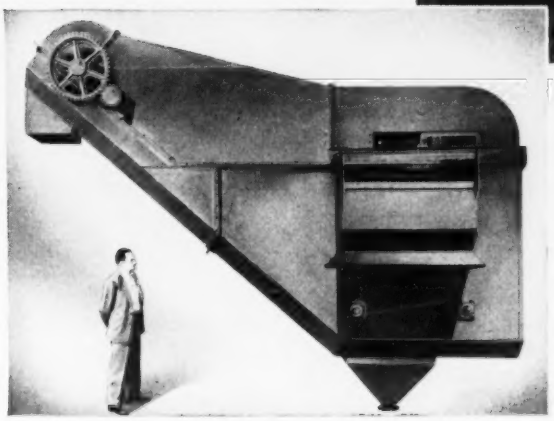
Month (1952)	Tons per man day	Percentage of Mine Production
February		24.5
March		27.0
April		38.7
May		38.1
June	64.1	45.6
July	64.1	58.3
August	59.6	69.0
September	74.9	76.2
October	82.6	70.4
November	106.6	71.4

50% LESS FLOOR SPACE

Needed for *New* Wilmot-Daniels Heavy Density Unit

Unequalled Compactness Results from Its Complete-in-1-Unit Construction and Elimination of 5 Major Parts and 4 Motors. Unit Is also Custom-Designed to Fit Your Space. New System Eliminates the Two Most Common Heavy-Media Problems.





Above, size 150-A Wilmot-Daniels Heavy-Density unit; feed capacity, 150 tons per hour. Also available in sizes for finished product capacities of 50 to 500 tons per hour. Wilmot-Daniels units are furnished in 4 types to fit varying plant set-ups. All are of the complete-in-1-unit construction shown above.

The really revolutionary nature of the advances in efficiency made by the new Wilmot-Daniels heavy-media unit is indicated by the fact that it requires 50% less floor space. To this real reduction in capital cost, add the direct saving that results from the fact that the Wilmot-Daniels Heavy-Density unit is custom designed to your requirements and local conditions. You are not forced to adapt your plant to a "package" unit.

Remarkable simplicity is another advanced feature. The unit contains 5 less major parts and 4 less motors. It employs many standard parts for ease of maintenance. The refuse conveyor, for instance, is of the conventional flight type.

Let us send you Bulletin 521 describing the complete technical details of how this new system operates to increase yield and promote product control for both metal and coal producers.

Send for BULLETIN 521

W WILMOT

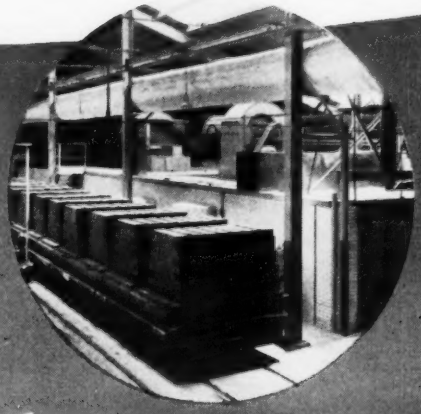
WILMOT ENGINEERING CO. HAZLETON, PA. Plant: WHITE HAVEN, PA.

HEAVY DENSITY DIVISION

an exceptional refractory for metallurgical furnaces

Harbison-Walker

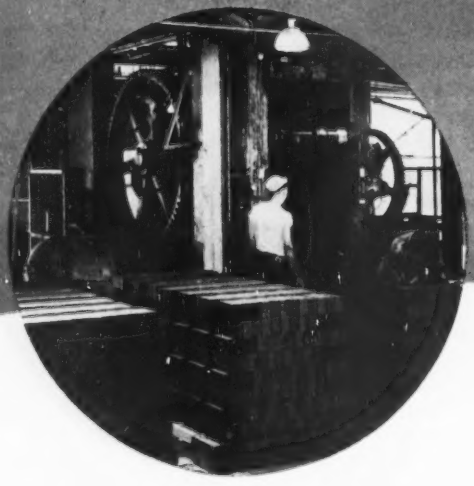
Chromex B



Every step in the manufacture of the CHROMEX B refractory—from the selection and storage of raw materials to final inspection and shipment of the finished product—is carefully checked and controlled. The photographs shown here are from the modern Harbison-Walker plant at Baltimore, Maryland, where all types and classes of basic refractories are in large-scale production. The illustration at the right shows tunnel kiln cars loaded with basic brick for firing at extremely high temperatures. At the lower left is shown a heavy duty power press.

Carefully Controlled Manufacture

Means highest quality and dependable uniformity . . .

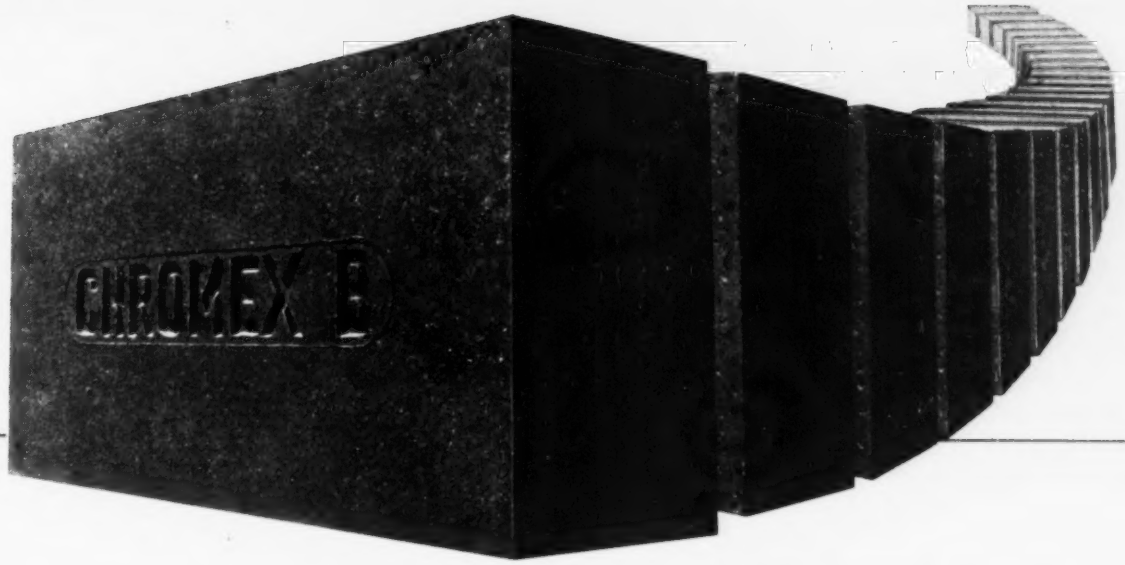


Exceptionally high standards of workmanship and uniformity are maintained by the use of the most modern equipment and manufacturing methods.

The composition, method of manufacture and very high temperature at which CHROMEX B brick are fired, account for the exceptional combination of highly desirable properties of this refractory.

HARBISON-WALKER

WORLD'S LARGEST PRODUCER OF REFRACTORIES



a hard-burned chrome-magnesite refractory

for extremely severe operating conditions

LONG EXPERIENCE has proved CHROMEX B to be outstanding for use in such applications as copper converter linings, copper refining furnaces, side walls and roofs of lead furnaces, and various parts of open hearth and electric steel furnaces.

For applications requiring high refractoriness, volume stability, basic slag resistance and exceptional strength at high temperatures, CHROMEX B is worthy of your consideration. We will gladly provide full details on this service-proved refractory.

REFRACTORIES COMPANY
AND SUBSIDIARIES
General Offices • • • PITTSBURGH 22, PA.

TRADE MARK
REG. U. S. PAT. OFF.

New Products Popularity Poll

101 New Products that Scored Highest in 1952

All returns are in from the outlying precincts and on the next 12 pages you will find the results of the poll of new products of 1952. *E&MJ* readers were the voters and the postage-free reply card found each month in the New Products Digest was the ballot. Leading items were selected each month and in each of the NPD's sub-departments like "For Your Files" and "Equipment Shorts." On this basis, we're sorry that space didn't permit us to use certain items that received terrific responses but were featured in a month when numerous other items proved as good or better attention-getters.

None of the items on the next 12 pages is keyed to the reply card, because opportunity to send for more information was presented in earlier issues, and because servicing such a great number of products would seriously slow down the handling of monthly routine responses to the New Products Digest reply cards. If you want further information on any of these products, please address a letter or card to

New Products Editor
Engineering and Mining Journal
330 W. 42nd St.
New York 36, N. Y.

Because of space limitations, we have not included items on large earth-moving equipment, tractors and powershovels. Later in the year we will present a comprehensive review of developments in heavy equipment.

'52 SHORTS

SILICONES. A complete line of silicones is listed and briefly described in "A Reference Guide to Dow Corning Silicone Products." These products include silicone fluids, water repellents, compounds, greases, resins and varnishes, silicone rubber, and a long list of silicone chemicals. Perhaps millmen will be able to find some use for an anti-foam emulsion which is used in very small amounts to break down froth. Smeltermen should investigate the greases and lubricants that perform under extremely low or high temperatures. Mine electricians who are plagued with insulation failures due to heat, oil, or moisture should take a second look at silicone insulations which resist these conditions, and do not burn to carbon (a conductor) when overheated. Motors insulated with silicones can operate safely way above rated temperatures, and even under water. Here's your chance to explore a long list of useful silicone products which may eliminate many operating headaches.

ELECTRIC MINE HOISTS. This book published by Westinghouse Electric Co., East Pittsburgh, Pa. is an excellent handbook on mine hoisting. In addition to describing various electrical systems, it contains instruction and examples enabling the reader to calculate power and equipment requirements for various installations.

HANDY DRILLING GUIDE. Rockbit Sales and Service Co.. Philadelphia, Pa., has issued a practical booklet telling how to get the most service out of carbide Rok-Bits. The handy guide tells how to install the bit, how to remove the bit, how to inspect threads, how to sharpen the bit, and concludes with other important suggestions pertaining to the Rockbit line of threaded bits and intra-set drill steel.

JET-PIERCING. Linde Air Products Co., New York 17, N. Y., explains how a high-temperature supersonic flame can be used to "drill" rock in a new pamphlet entitled "Jet-Piercing—Key to Taconite Development." This unit is good for primary and secondary blasthole "drilling."

LIQUID STAINLESS STEEL. If you have corrosion problems in your mine, mill, or smelter, it will pay you to learn more about liquid stainless steel. This product made by Slip-On, Inc., New York 13, N. Y., consists of tiny flakes of 18/8 stainless steel in a binder of carefully selected plastics. It can be used to coat wooden tanks, and steel or other metal surfaces. It makes the surfaces resistant to chemical action of salt, alcohol, gasoline, sodium hydroxide, sulphuric acid, hydrochloric acid, nitric acid, and other corrosive or abrasive materials. (Need we say more to hydrometallurgists and smelter operators?)

MINERAL SPECIMENS FOR MICROSCOPE. Six sets of mineral specimens for microscopical studies in petrology and mineralogy are available from R. P. Cargille, New York, N. Y. One set has 60 minerals and glasses of known refractive index from 1.34 to 2.4, with intervals of 0.01 through most of the range. Valuable for comparison with unknown minerals by immersion method and useful for determining refraction index of unknown liquids. Another set includes 60 powdered minerals. There are three sets, 25 slides each, of comminuted minerals mounted in balsam. The other set has 25 minerals and rocks for demonstration of various optical characteristics.

BALL MILLS. For developing small properties or increasing mill capacity, Denver Equipment Co. (Denver, Colo.), offers the 30-in. "Convertible" ball mill. Muleback portability and easy extension of capacity by addition of 18-in. sections make this a good bet for remote properties.

PLASTIC PIPE. Higher working pressures are claimed for new Type "WS" plastic pipe of Carlon Products Corp., Cleveland, Ohio. It is available in nine sizes from ¾ to 6 in. Working pressure is 120 psi at 120 deg. F. in sizes up to 1½ in., and slightly less in larger sizes.

SAFETY HELMET. Fiberglas safety hat weigh 12 oz., is fireproof, weatherproof and adjustable to all head sizes from 6½ to 8. Industrial Products Co., Philadelphia, Pa., supplies it in five standard colors.

MULTI-PURPOSE GREASE. A new multi-purpose grease called "Texaco Multifat 2" suitable for bearing lubrication over a wide range of temperatures has been introduced by The Texas Co., New York, N. Y.

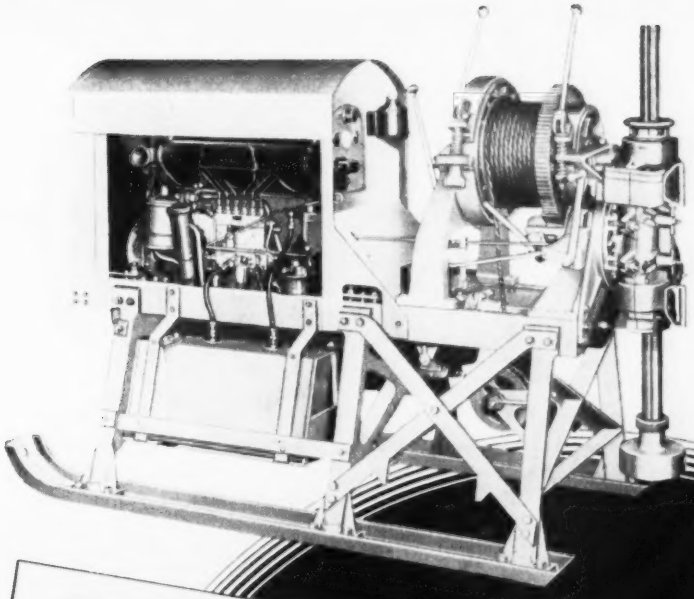
ALUMINUM WELDING. If welding aluminum is a problem for you, you'll want to learn more about "Chemalloy" which is billed by its manufacturer as "an improved and simplified means for the soldering and welding of aluminum." Chemalloy Associates, Santee, Calif.

SAMPLER. A 12-in. short stroke sampler features a right angle cut across the stream to be sampled, taking equal percentages from all parts of the stream. By means of a timer, cut can be made automatically as frequently as desired and interval between cuts remains constant. Three types of cutter heads are available for wet and dry materials flowing under different conditions. Galigher Co.

HARDENING COMPOUND. Armor-Tuf, a steel-hardening compound, is guaranteed to increase the life of tools at least 30% or your money back, according to Armor-Tuf Sales Corp., New York, N. Y.

Easy steps in application are:

1. Heat tool to cherry red in furnace, forge or by torch.
2. Dip or roll in Armor-Tuf, covering completely.
3. When crust forms, reheat in furnace or by torch.
4. Quench quickly in water, brine or oil.



DIESEL POWERED

Boyles Bros. now offer you a diesel driven BBS-2 surface core drill. Here is the versatility of four interchangeable swivelheads—1½" to 12" holes—combined with the fuel and operating economy of diesel power.

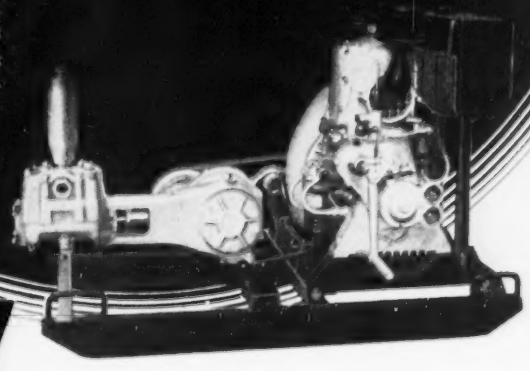
These diesel equipped units are proving highly satisfactory on our world wide contract commitments. Conversion kits available for gas driven models.

shipping weights (diesel)

drill with swivelhead	domestic	export
BUS-12AG	2970 lbs	3475 lbs.
BUS-12AH	3315	3905
BUS-23HH	3590	4180
BUS-23HFG	3540	4200

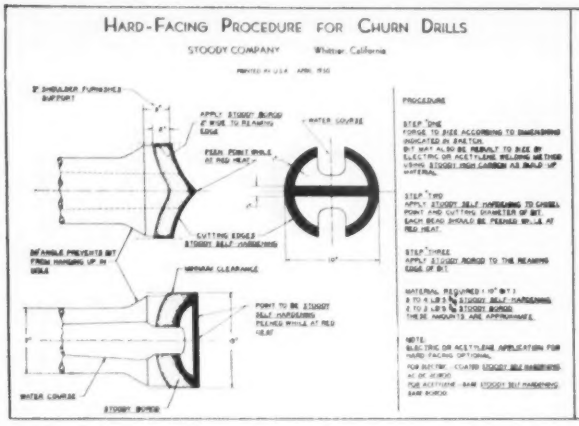
write for bulletin No. 172

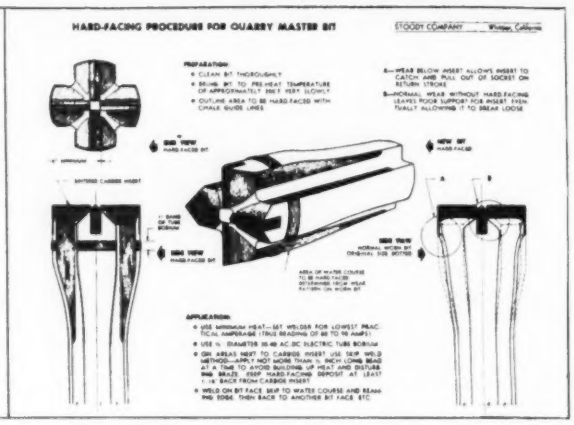
New diesel motor cuts fuel costs on this rugged high pressure pump - - provides easy hand starting under all conditions. Engineered to our specifications, the dual capacity 5-12 meets a wide range of drilling requirements throughout the world.



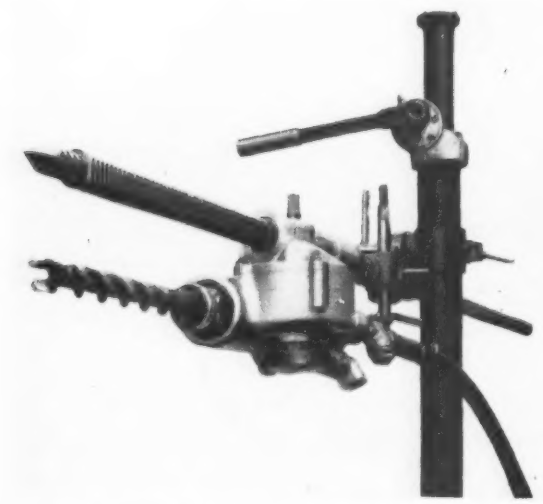
WE LOOK INTO THE EARTH

BOYLES BROS
DRILLING COMPANY LTD.,
VANCOUVER, CANADA





IF YOU WANT INFORMATION on the methods of hard-facing Quarry-Master bits and churn-drill bits, as presented by the Stoody Co. of Whittier, Calif., send a card or letter to E&MJ New Products editor.



ROTARY DRILL is pushed into rock along the feed bar. Feed bar is held in position by quick release rathcet on light, quick setting prop. Clutch and gearbox mechanism are built into drill.

Rotary Drilling Takes on Medium Hard Rock

VICTOR PRODUCTS LTD. Wallsend-on-Tyne, England, solely manufactures rotary drilling equipment both compressed air and electric. Constant research and world-wide experience, the company says, show that more and more stones are coming within range of their equipment.

Although it may not be a perfect method of doing this, they calibrate all results from the widest possible field against a scleroscope method of testing the material to be drilled and find that they can get a very clear guide as to what they can or cannot drill.

For example, providing conditions are suitable for the introduction of rotary drills, they can drill:

Limestone (Medium Hard)—1 ft. per minute.

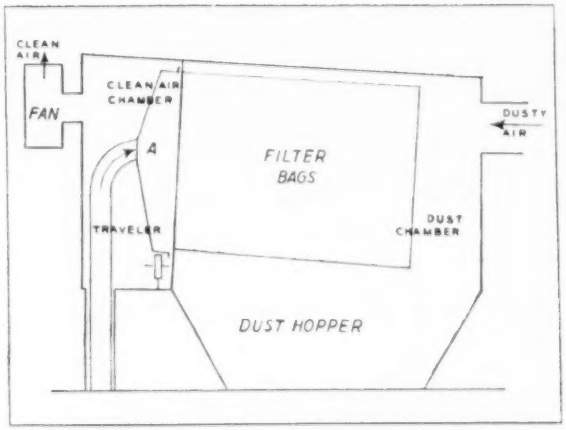
Sandstone (Medium Hard)—9 in. per minute.

The above figures are of course approximate. At present granite is outside the range of rotary drilling equipment.

It is to be appreciated that rotary drilling differs from percussive drilling in that a rotary drill has to be pushed into the work, or alternatively, a back pressure has to be overcome. As progress is made up the hardness scale, the job changes from a hand-held proposition to something requiring a mechanical means of applying pressure, i.e. a feed mechanism, which means some method of support, generally a prop. Consequently many stones are capable of being drilled by rotary means, but because of the impossibility of selling a support, are not an economical proposition.

For stone drilling a recent development has been a power-fed drill available for electric or compressed air motive power. Victor argues that the average miner and underground mechanical engineer wants the simplest possible equipment, and they believe they have gone a long way to provide this. It may not be the answer for power drilling in main road development, but it is proving the answer for what might be termed secondary work.

With all rotary drills, they use a twisted steel rod and a twin-legged tungsten carbide tipped drilling bit.

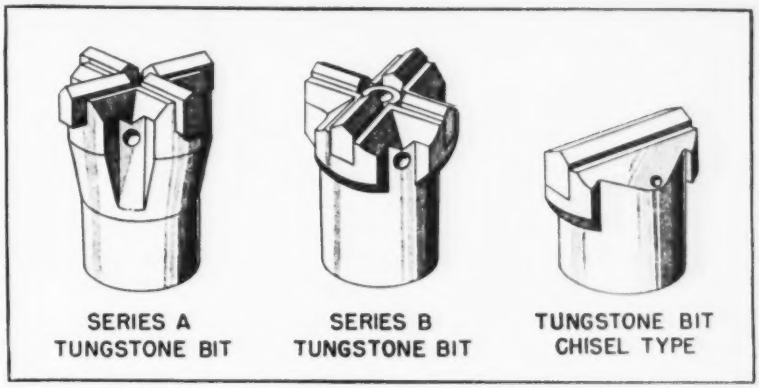


DYNACLONE DUST COLLECTOR Traveling device across open end of filter bags, reverses airflow in one bag at a time. Constant cleaning assures uniform suction at dust sources, eliminates bag shaking for longer service. W. W. Sly. Mfg. Co., Cleveland, Ohio.

"Tailored" TC Bits

JUNCTION BIT & TOOL CO., Grand Junction, Colo., is now producing tungsten-carbide (Tungstone) insert bits which are "tailored" to meet specific requirements of mining projects. Ray Sullivan, well known for his pioneering work on tungsten carbide drilling in this country (see *E&MJ*, Mar. 1951, pp. 57-60), is in charge of production of the bits. As a matter of policy, he says that his company requests prospective users of Tungstone bits to supply complete information about the size of rock drill to be used; type texture, and hardness of rock to be drilled; type of water hole required, etc. A "tailored" bit to meet these requirements is then recommended.

The bits are supplied with any type or size of thread desired. In certain experiments it has been found that some threads actually cause bit failure because the tightening action of the bit on the steel during drilling sets up excessive strains. Hence the right type of thead is important.



Three Types Available

Series A. Tungstone. This series is designed with large gage and cutting edge clearances usually required for soft rock formations. Suitable for use with light drifters, jackhammers, wagon drills, and stopers. Sizes from 1½ to 3 in. Bit comes with one or two sideholes. Center hole is plugged, but may be left open if desired.

Series B Tungstone. For use with heavy drifters, wagon drills, and in long-hole drilling. **Contains** standard side and center holes. Additional side holes may be ordered. Sizes range from 2 to 3 in.

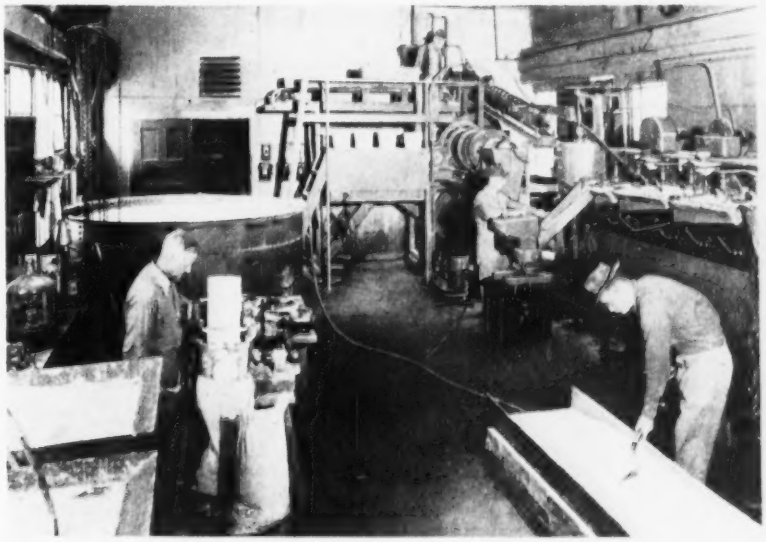
Tungstone Chisel Type. Suitable for use where the four-point types will not work. This bit is faster in some types of rock.

Three Grades of Carbide

Tailoring of these bits is further refined by the selection of tungsten carbide inserts which will perform best for the rock to be drilled. Three grades are used: (1) Hard—for extremely abrasive rock, but for use with light machines. This type will outwear the tough type insert 1½ to 1. (2) Tough—a general purpose insert. Safest to use when in doubt, and suitable for large and small machines. (3) Soft—for limited use only.

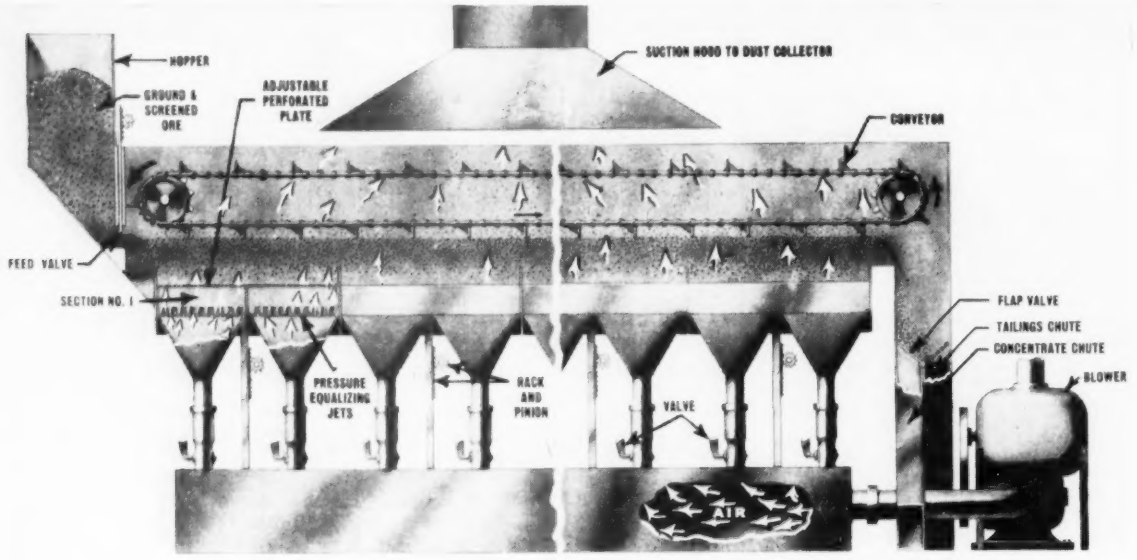
The Junction company also makes integral-type insert bits. Tungstone bits are now in production.

NEW TUNGSTEN CARBIDE BIT. Brunner & Lay, Franklin Park, Ill., has added a new complete line of tungsten carbide bits called Brunner & Lay Rok-Bits to their products. They are available in all sizes from 1½ to 4 in. Internal threading of bit prevents bottoming of the steel when proper drill steel is used. According to the manufacturer, these design principles insure that thread wear and damage is held to a minimum..



ORE TESTING LABORATORY. Denver Equipment Co.'s modern continuous ore testing laboratory shown here is designed to "take the guesswork out of milling" and to develop flowsheets which will help the mine operator make a profit on his ore. The laboratory is set up to conduct tests involving crushing, grinding, classification, jigging, flotation and other processes. Over 150 different kinds of metal and nonmetallic minerals can be tested in DECO's laboratory.

During the past five years the DECO laboratory staff has completed successful tests on more than 1,000 ores covering 85 different minerals from 40 countries throughout the world. Charges for this test work are very nominal—just sufficient to cover the actual operating costs including the analysis and assay (both fire and chemical) of the test products.



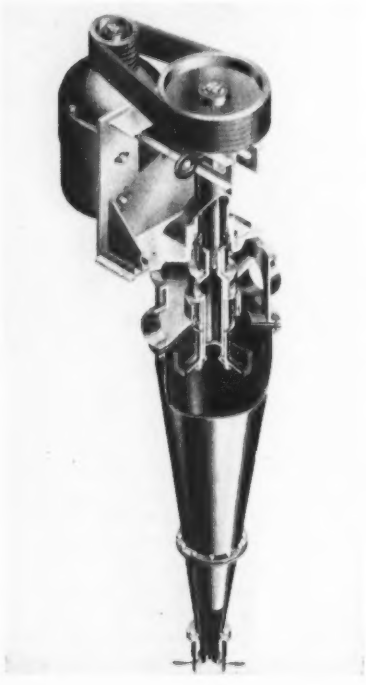
Dry Concentrator Offers High Recoveries

A 99% RECOVERY of gold, silver or lead from your ore is the claim of Dry-Ore-Concentrator, Inc., Redmond, Wash., for their new unit. Low first cost, lower power cost and minimum power requirement are added attractions. Ore need not be ground to a finer mesh than necessary for full release of mineral content. By varying the number of cells, capacity can be varied from 10 to 75 tons per day. For packing to remote points, the machine can be dissembeled into parts, none of which weighs more than 150 lb.

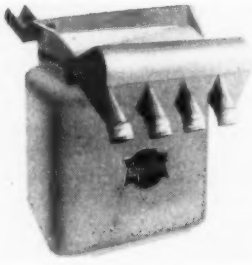
Dry, screened ore is fed by gravity from the hopper through the controlled feed valve into the conveying system over a blank area equal to the space between the blades of the conveyor chain. The ore is carried to the first of eight sections, each of which has four cells. (To show operating details, four central sections have been removed from the illustration above.) Compressed air, forced up through the perforated plate of the cells causes the ore to float on a continuous air suspension in an animated state. The metallic content of the ore is heavier than the gangue and falls into the cell. This process is repeated over the eight sections to remove a maximum of metallic material from the ore.

When sections become full of concentrates, the feed valve at the base of the hopper is closed to shut off the flow of fresh ore. The perforated plate bases are raised to a point level with the conveyor blades which carry off the concentrates over the same route used by the gangue. The flap valve, which during the separating operation had been open to the tailings chute, is now changed to close the tailings chute and opened to the concentrate chute. When the concentrates have been drawn off, the cell bases are lowered to the running position and the feed valve is opened, to resume separation on a continuous operating cycle.

For more information on these products write New Products Editor, E&MJ, 330 W. 42nd St., N. Y. 36, N. Y.



←CENTRICLONE. Equipment Engineers, San Francisco 4, Calif., is now manufacturing a new Centriclone classifier which has operating characteristics of the cyclone and centrifuge. It combines the independent variation of residence time and velocity attributed to a centrifuge with the tremendous shearing force of a cyclone. Overflow particles can be held below 5 microns in size, and underflow solids can be thickened with 98% weight recovery. Sharp classification is possible in the 65 to 200-mesh range. Comes in 10, 20, and 30-in. sizes having capacities of 30-100, 150-600, and 250-800 gpm, respectively.



LAB-SIZE SEPARATOR Weighs less than 100 lb. measures 22 x 25½ in. Uses air-flotation principle to effect gravity separation. Sutton Steele & Steele, Inc.

KENNEDY

Machinery and Equipment

for cement, lime and mining plants

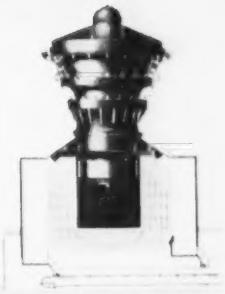
...IN USE THE WORLD OVER

Good machinery just doesn't happen! It is the result of sound design, engineering and manufacture . . . the kind of facilities which distinguish *all* KVS products . . . world-famous for their mechanical excellence and economy of operation.

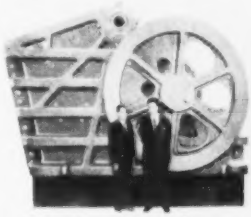
In their Danville, Pa., plant, occupying over 20 acres of space, KVS manufactures everything from a crusher to a complete cement, lime, or mining plant. The importance of world-wide experience in designing and building machinery and equipment which delivers maximum output at lowest operating costs is demonstrated in every KVS installation.

Whether your requirements call for the addition or replacement of a single piece of equipment, the modernization of an existing layout or the building of a complete plant for the manufacture of cement, lime or mining operations, Kennedy engineers are at your service to assist in planning, creating and specifying the installation best suited to your needs.

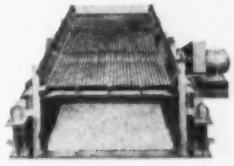
KVS engineers are available for consultation anywhere in the world. We invite your inquiries regarding our machinery and equipment . . . literature is available upon request . . . to help you determine the BEST method of solving your individual problems. Get the KVS story *before* you specify!



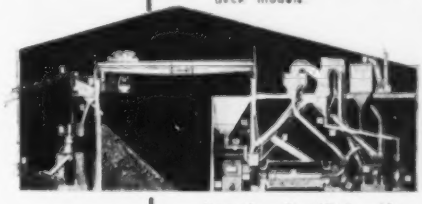
Gyratory Crusher, primary and secondary types, with double discharge outlets.



Swing Jaw Crushers: Heavy duty models, reversible jaws.



Vibrating Screens: Four way motion; removable mesh; single, double or triple deck models.



Kennedy Stratified Air Swept Tube Mill.

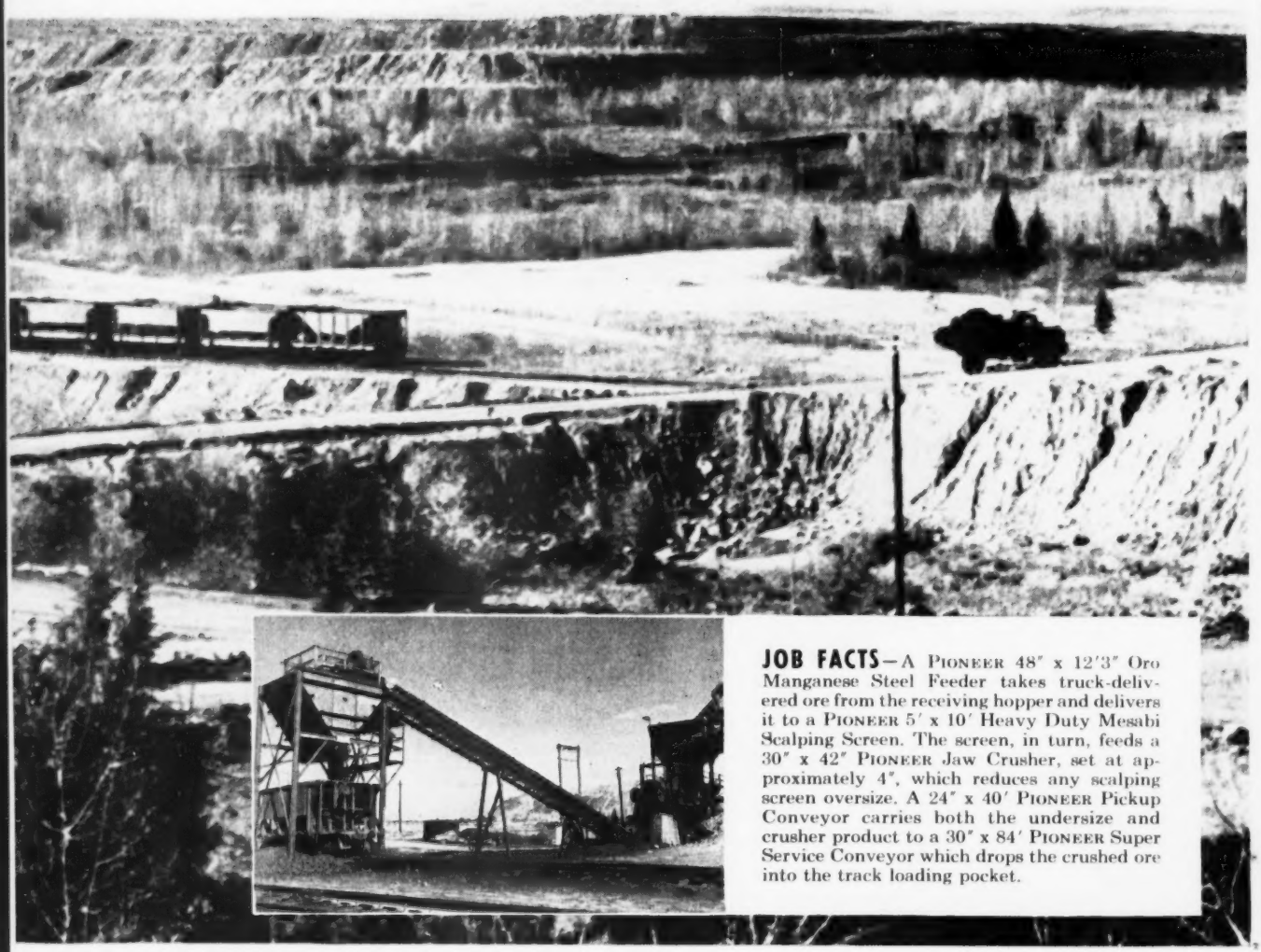
Kilns, Coolers, Dryers: Built sectionally; any length or diameter.

IT COSTS LESS.. TO OWN THE BEST!

KENNEDY-VAN SAUN
MANUFACTURING & ENGINEERING CORPORATION
TWO PARK AVENUE, NEW YORK
FACTORY DANVILLE, PA.

When mining men have seen it in action...

that Pioneer Edge



JOB FACTS—A PIONEER 48″ x 12′3″ Oro Manganese Steel Feeder takes truck-delivered ore from the receiving hopper and delivers it to a PIONEER 5′ x 10′ Heavy Duty Mesabi Scalping Screen. The screen, in turn, feeds a 30″ x 42″ PIONEER Jaw Crusher, set at approximately 4″, which reduces any scalping screen oversize. A 24″ x 40′ PIONEER Pickup Conveyor carries both the undersize and crusher product to a 30″ x 84′ PIONEER Super Service Conveyor which drops the crushed ore into the track loading pocket.

BUY BOTH!
HIGHER OUTPUT
LOWER UPKEEP

Pioneer

Continuflo EQUIPMENT

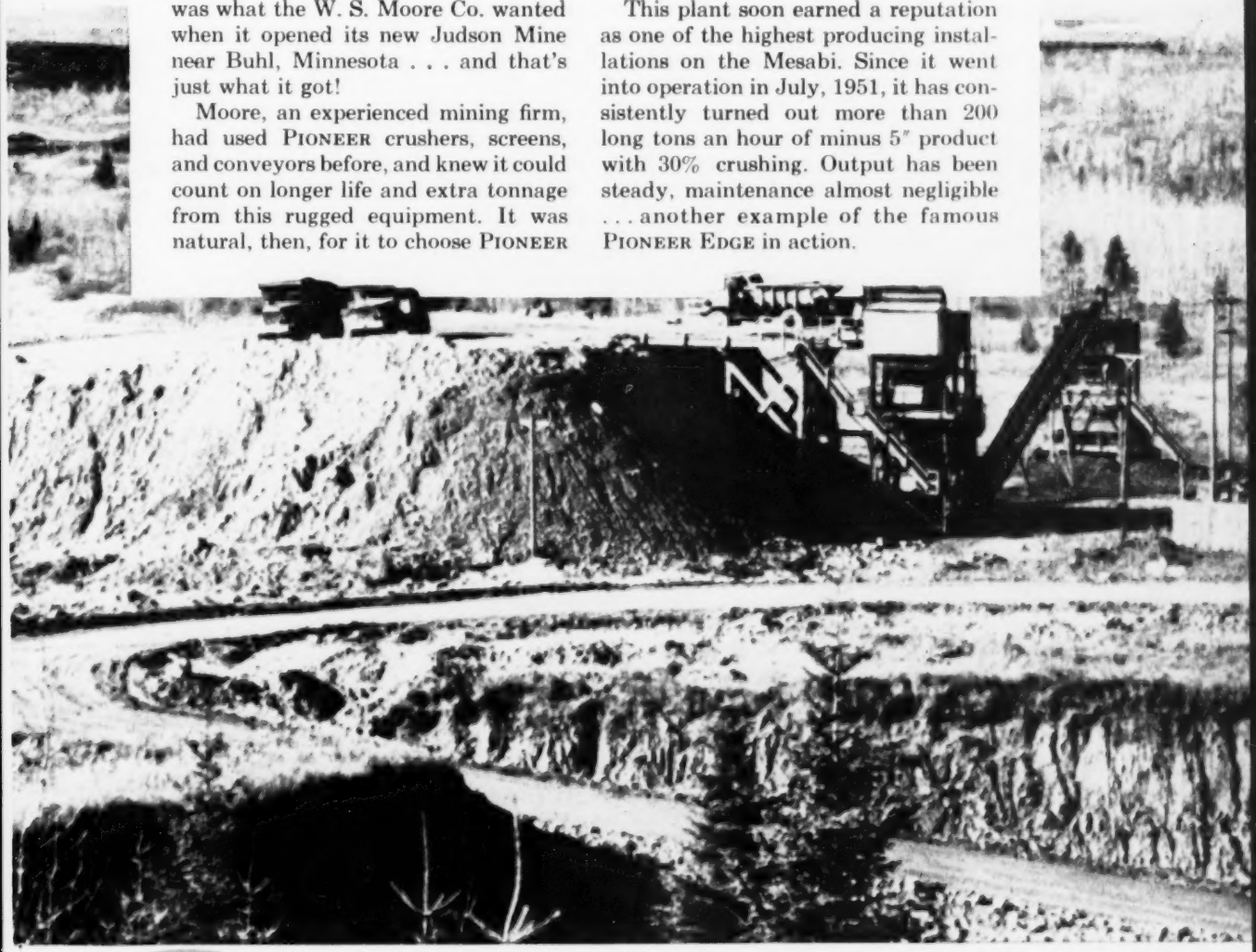
is a natural choice

Moore picks Pioneer equipment for new Judson Mine

● Fast, efficient, low-cost production was what the W. S. Moore Co. wanted when it opened its new Judson Mine near Buhl, Minnesota . . . and that's just what it got!

Moore, an experienced mining firm, had used PIONEER crushers, screens, and conveyors before, and knew it could count on longer life and extra tonnage from this rugged equipment. It was natural, then, for it to choose PIONEER for this important new assignment.

This plant soon earned a reputation as one of the highest producing installations on the Mesabi. Since it went into operation in July, 1951, it has consistently turned out more than 200 long tons an hour of minus 5" product with 30% crushing. Output has been steady, maintenance almost negligible . . . another example of the famous PIONEER EDGE in action.



Why Mining Men Choose Pioneer

Up on Minnesota's Mesabi Range, where ore-bearing rock is hard and tough, and equipment must be rugged, you'll find more PIONEER Feeders, Jaw Crushers, and complete washing plants than all other makes combined.

Why? The answer is the PIONEER EDGE . . . the extra operating margin which guarantees *greater output* and *lower upkeep* to the experienced mine operator.

PIONEER ENGINEERING WORKS
1515 Central Avenue • Minneapolis 13, Minnesota
(SUBSIDIARY OF POOR & COMPANY • CHICAGO)

● Please send me information on the equipment checked.

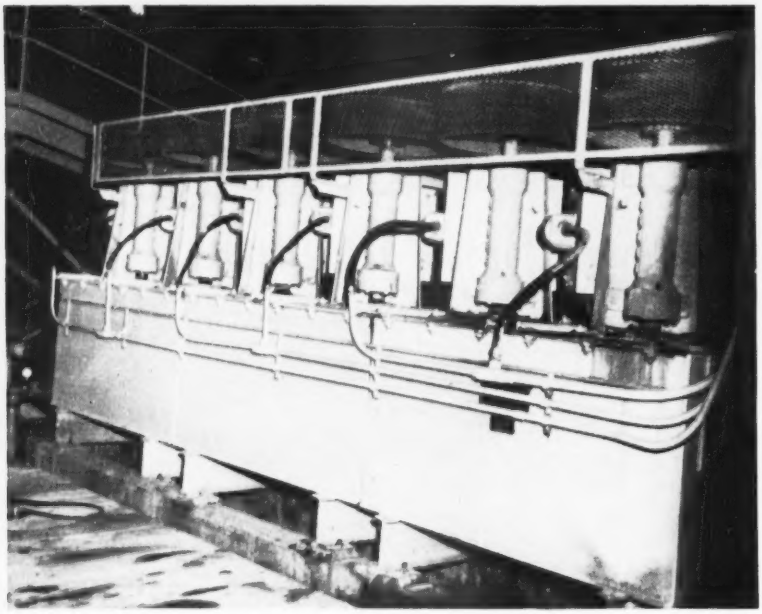
☐ JAW CRUSHERS	☐ WASHING PLANTS	☐ MECHANICAL FEEDERS
☐ ROLL CRUSHERS	☐ BITUMINOUS PLANTS	☐ VIBRATING SCREENS
☐ ROCK PLANTS	☐ APRON FEEDERS	☐ BUZZER SCREENS (LIGHT DUTY)
☐ GRAVEL PLANTS	☐ ORO FEEDERS	☐ CONTINUFLO CONVEYORS

Name _____

Company _____

Address _____

City _____ *Zone* ____ *State* _____



NEW WEMCO ATTRITION MACHINE cleans surfaces of mineral particles, and liberates sand cemented with various materials by means of controlled turbulence of high density pulp.

A New Unit for Milling Plants
The WEMCO Attrition Machine

A NEW METALLURGICAL and industrial processing unit—the WEMCO Attrition Machine—has just been announced by Ralph B. Utt, general manager of Western Machinery Co., San Francisco, Calif. Extensive field tests and laboratory investigations show that this unit will have wide application in ore dressing, coal preparation, sand and gravel beneficiation, and also chemical and several other widely used industrial processes.

What It Does

The new machine does two things, singly or in combination:

(1) Treats mineral particle surfaces. The attrition machine removes slime, oxidized surfaces, and reagent coatings undesirable for further processing. This cleansing and polishing action is highly beneficial in the treatment of minerals which have to be prepared to meet rigid market specifications.

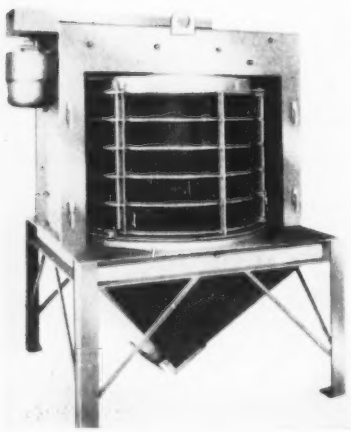
(2) Liberates cemented particles. In ores where particles are held together with a cementing material, the new machine liberates the grains from the cementing material. This action has specifically been applied to sandstones where grains were cemented by a material containing clay and finely divided minerals. (Editor's Note: This should be of great interest to carnotite producers on the Colorado Plateau where the ores are essentially sand, cemented by soft micaceous-textured minerals.)

How It Operates

WEMCO's attrition machine uses controlled turbulence of high-density pulp as an operating principle. This action stimulates the rubbing of particle against particle. Optimum density depends on the nature of the material treated. To date best results were obtained with 83% solids for several materials.

The machine is made up of two, four, or six octagonal-shaped cells operating in series, and mounted on a common base. Each cell includes a motor-driven vertical impeller shaft on which are mounted three 6-bladed impellers. Pitch of the impellers in each cell is alternated so that in Cell No. 1, the top impeller throws the pulp downward, the middle impeller throws the pulp upward, and the bottom impeller throws the pulp downward. Rotation is clockwise, and the pulp passes from Cell No. 1 to Cell No. 2 through an opening near the bottom of the partition between the two cells. In Cell No. 2 the impeller pitches and direction of rotation are opposite to those in Cell No. 1, and the pulp flow to Cell No. 3 is through an opening near the top of the partition between cells.

New Screen Has High Capacity



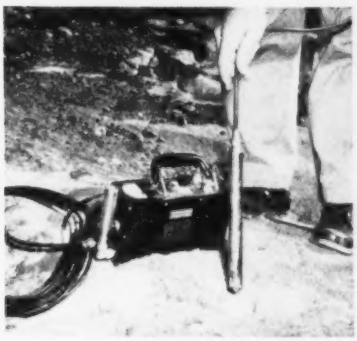
HIGHER CAPACITY, less floor space and less tendency to blind are the claims made for the new cylindrical screen introduced by Nordberg Mfg. Co., Milwaukee, Wis. Trade-named "Symons" V Screen, the unit will separate wet or dry material from 4 mesh to the very fine meshes.

Mounted vertically, the cylindrical screen is 3 ft. high and 12 ft. in circumference, giving 36 sq. ft. of screening surface.

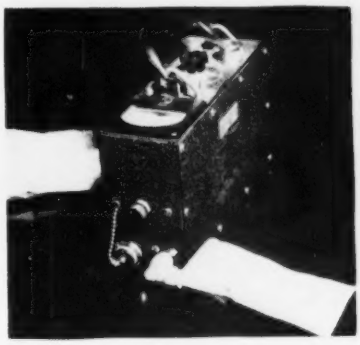
A cupped feed plate with radial vanes sets a little below the upper edge of the drum. Material to be screened enters through an opening in the top of the frame and is impinged by the feed plate against the inner surface of the drum. The oversize particles are held against the screen for a brief interval with the fines passing through. Using 14 gyrations to one drum rotation, each gyration of the drum produces an inward deflection of the material being screened. This frees the holes in the screening surface for the passage of undersize at the next contact and permits the material to drop a short distance. This process is repeated in a similar manner until the particle either goes through the cloth or is discharged as oversize.

Wear on the cloth is extremely low because there is no sliding action of the particle on the cloth during screening. Cloth is easy to change if different mesh is desired.

When used for wet screening, water sprays are mounted in the lower assembly with sprays impinging upward and outward.



PROBE ATTACHMENT makes the counter adaptable for logging drill holes as well as for general prospecting.



GEIGER COUNTER features a dial that can be read directly in percentage U_3O_8. Calibrated, the unit can be used for assays.

Geiger Counter Assays Radioactive Ores

A DIAL THAT READS directly in percentage of U_3O_8 makes Minerals Counter Model 600 adaptable for assaying radioactive ores as well as for uranium prospecting. A probe attachment also permits the logging of drill holes.

Five ranges of sensitivity are controlled by the large fluted knob in the center of the counter. No. 5 position, the most sensitive, is for prospecting and determining small amounts of uranium in hand samples and pulps. No. 1 is for measuring intense radiation.

A one-stage amplifier, pulse generating circuit, and balanced-bridge type electrometer, make up the integration circuit. The left knob balances the bridge circuit—or unbalances it, to compensate for, or zero out, low background count when assaying ore samples.

Size of pulses in the pulse-generating circuit is controlled by the right knob, thus controlling meter deflection for a given amount of radiation in different ranges.

Low, medium, and high rates of integration time are controlled by the switch below the meter. Medium is usually sufficient; high or long-time integration may be needed on low-grade samples.

In assaying, the No. 4 sensitivity scale is used. The pointer is zeroed in to eliminate small amounts of background count. Next, the tube is calibrated against a standard sample (preferably assaying 0.40 to 0.60% U_3O_8). When the meter has been adjusted to read the same as the assay for the standard, and to return to zero when the standard is removed from the tube, the counter is ready to check unknown samples. If the background count is high, it should be measured on scale No. 4 and added to the assay of the standard.

All assay readings must be taken under identical conditions to get good results. This means grinding to the same mesh, using the same quantities. If regular pulp envelopes are used, spread all samples to uniform thickness. All containers should be placed on tube, in same position, and other samples should be kept at least 5 ft. away.

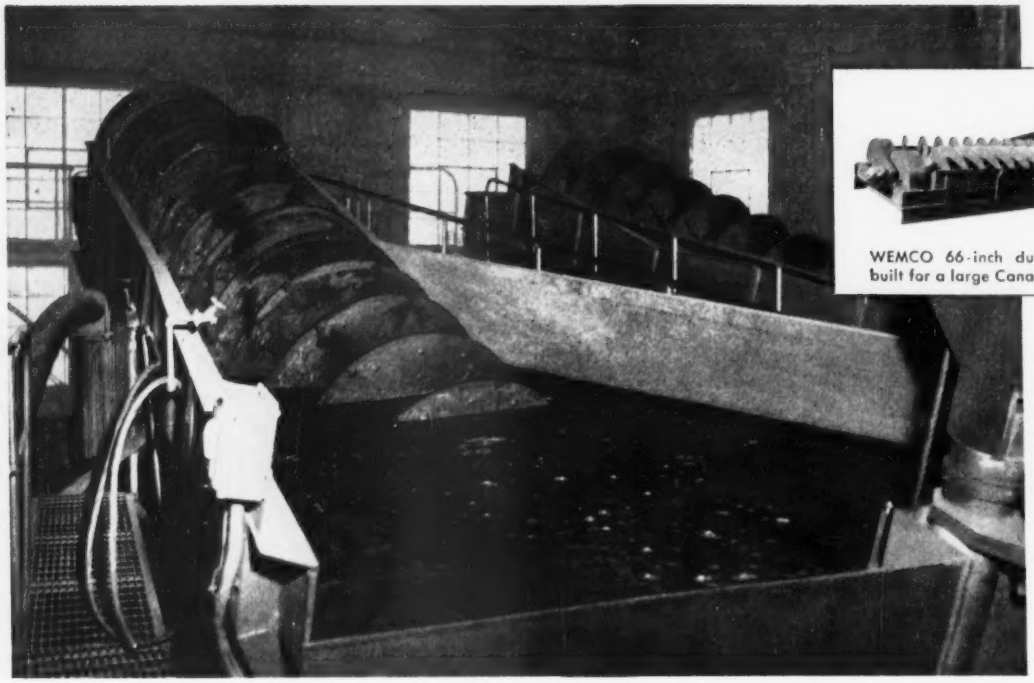
The Minerals Counter is made by Minerals Engineering Co., Grand Junction, Colo.

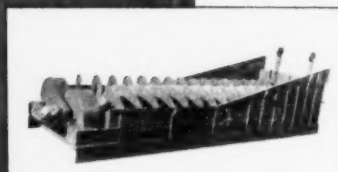
SCINTILLATION METER. Exceptional sensitivity and stability are said to feature scintillation survey meter designed for AEC by Nuclear Research Corp., Philadephia, Pa. Meter is self-contained, portable, designed for field use. Waterproof construction permits immersion without damage.

SCINTILLATION COUNTER can be operated from plane or moving vehicle. Weighs only 4 lb. Ranges are 0.05, 0.5 and 5 milliroentgens and accuracy is within 5% of ¾ full-scale reading. Made by Precision Radiation Instruments, Los Angeles, Calif.

GEIGER COUNTER weighs less than ½ lb., including headphones. It's just 1 in. dia. and 4 in long. Tradenamed the "Geiger-Mite," it does not require batteries and is self-charging. Power is supplied by a self-contained electrostatic generator and energy storage unit. The unit is permanently sealed and waterproof. For initial charge, shake up and down about 30 times. Price is $29.95. Morgan instrument Co., Canoga Park, Calif.

For more information on these products write New Products Editor, *E&MJ*, 330 W. 42d St., N. Y. 36, N. Y.





WEMCO 66-inch duplex classifier built for a large Canadian operator.

Two 60-inch, series 150 WEMCO S-H Classifiers in the regrind circuit of a large lead-zinc concentrator.

for better Classifier performance

in terms of

- *Less Oversize in Overflow*
- *Less Undersize in Sands*
- *Lower Operating Costs*
- *Longer Continuous Operation*
- *Greater Capacities*

—use ***WEMCO*** *S-H Classifiers*

These Exclusive Mechanical Features *of WEMCO S-H Classifiers are among the important reasons why* ***only*** *the WEMCO unit gives you these better performance factors — with the result that more and more operators throughout the world are choosing WEMCO for their classification jobs.*

1. **40% greater shaft strength,** for protection against shutdowns, is provided by WEMCO's large diameter tubular shafting.
2. **Longer-life wearing shoes** of tough, thick alloy and large cross-section, short cast steel flight arms. Shoe replacement costs have been reported as low as 4/100 of 1 cent per ton.
3. **Foolproof, efficient bearing units** are of the anti-friction type. Lower unit is grit-proof; upper unit is gudgeon type mounted on hub of bevel gear, designed for extra long life.
4. **Simple, hydraulic lifting device** gives uniform action and complete protection from clogging or jamming.
5. **Smooth, efficient drive** uses standard speed motors and a new type cone gear reducer for maximum efficiency of power transmission.

Consult with WEMCO today on your classification problems. Competent engineering of your inquiry will be handled promptly and places you under no obligation.

WEMCO

WESTERN MACHINERY COMPANY

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Mobil Mills · Coal Spirals · HMS Thickeners · HMS Pumps · Sand Pumps · Cone Separators · Drum Separators · Fagergren Laboratory Units · Agitators · Fagergren & Steffensen Flotation Machines · Hydroseparators · S-H Classifiers · HMS Laboratory Units · Dewatering Spirals · Thickeners · Conditioners · Densifiers · Attrition Machines

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- The Ore & Chemical Corporation, 80 Broad Street, New York 4, N.Y.
- Fraser & Chalmers (S.A.) Ltd., P.O. Box 619, Johannesburg, South Africa
- Lilestone & Co., Inc., P.O. Box 3368, Manila, Philippines
- United Development Corporation Pty. Ltd., P.O. Box 3460, Sydney, N.S.W., Australia
- Corporation Commercial Sudamericana S.A., Casilla 505, Lima, Peru

Pocket-Size Gadget Measures Machine Vibration

A POCKET-SIZE INSTRUMENT for accurately measuring the speed and amplitude of vibration on machinery or on bins and hoppers where vibration is produced intentionally to aid materials movement, is now available to the industrial field at the price of a fountain pen.

Martin Engineering Co., Kewanee, Ill., has been given sales franchises for the new vibration "slide rule" called the Fowler "Vibra-Tak."

The Vibra-Tak is only 6¼ in. long. It has a movable tuning slide that indicates on a number scale the speed of vibration. To operate the Vibra-Tak, you place the bullet nose against the vibrating object and move the tuning slide up and down the scale until the wire reed, which extends out of the nose as the slide is moved, reaches the maximum "throw." Then you simply multiply the scale reading by 1,000 to get the vibration in cycles per minute, or shaft speed in rpm. The arc through which the reed "throws" is in direct proportion to amplitude. It has a range of 2,000 to 15,000 cpm. Higher speeds register and can be closely estimated with reasonable accuracy.

Uses for the Vibra-Tak include: Finding vibrations per minute; checking rpm of high speed machines, if vibration is present; indicating the amount of vibration you get on bins and hoppers where vibrators are installed to aid in moving sand, grain, chemicals, food products, feed, cement, ground rock and other materials that resist motion toward the outlets of hoppers, bins, pipes or chutes.

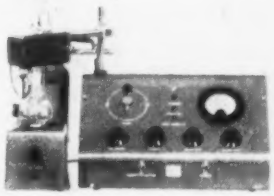
New Type of Rectifier Is Made With Germanium

GENERAL ELECTRIC CO. ANNOUNCES a new line of industrial rectifiers which can operate at current densities up to 1,000 times greater than existing copper oxide or selenium stacks. Made from germanium, this unit is considered to be the best rectifying material yet discovered. These industrial rectifiers are now being produced in limited quantities in these models: single-phase, half-wave ratings of 12 v./0.4 amp; 21 v./0.4 amp.; 27 v./0.4 amp.; 6 v./6 amp. Two models, RA-1 (left) and RA-2 (right) are shown above. The industrial germanium rectifiers are designed for power conversion in intricate computing machines, radar devices, and other applications where size and weight requirements are at a premium. Physically these new rectifiers occupy about 10 cu. in. per kw. of output capacity compared to about 350 cu. in. per kw. for selenium. Germanium in its natural state is not normally adapted for use in rectifiers. It must be treated to bring out its rectification properties.

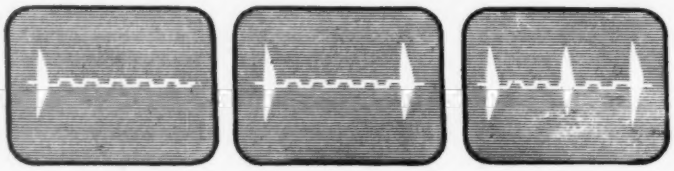
Operation tests of the new rectifiers at the rated voltage over a 5,000-hour period indicate no change in forward resistance and reverse leakage.

[Editor's Note: While these units are of limited size, it is known that work is being done on rectifiers for much heavier currents (300 amp.). Hence this will be an important development to watch. See also *E&MJ*'s article on germanium transistors. Feb., 1952 page 154.]

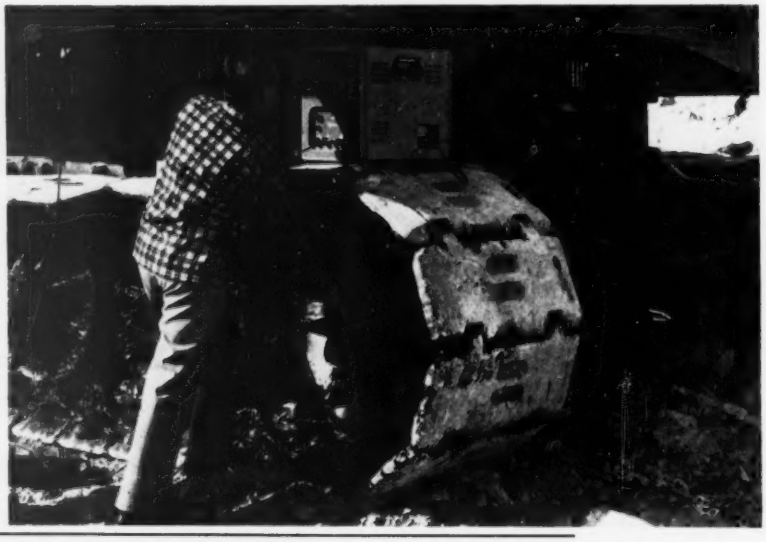
POLARIZING MICROSCOPE is designed for crystallography, chemical microscopy, and petrography. Magnifies up to 430X and cost is said to be about one-third of existing instruments. Angles can be estimated to 1 deg. American Optical Co., Southbridge, Mass.



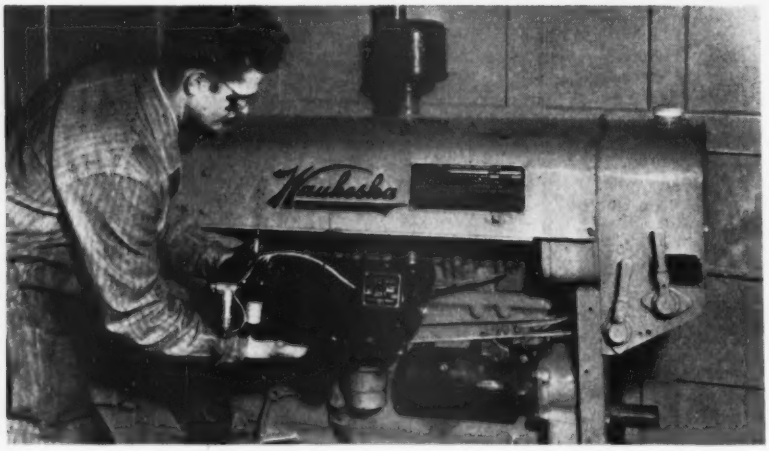
AQUAMETER provides quick, simple moisture determinations on almost any type of material. Electrically controlled unit completes automatic titration in less than two minutes. Beckman Instruments Inc., South Pasadena, Calif.

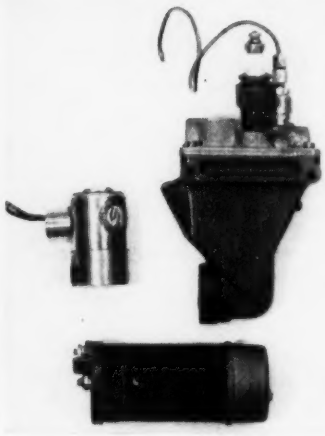


Power on. Ready for test. | No defect. Good material. | Defect indicated. Faulty material.



REFLECTOSCOPE. Purpose of this instrument, made by Sperry Products, Inc., Danbury. Conn., to reveal dangerous flaws or cracks in metals, ceramics, or other materials. The Reflectoscope products ultrasonic pulses which are sent through parts under test. An image appears on the screen which tells whether a flaw is present or not. (See illustration above.) The unit is used to check heavy machinery parts as shown. Can also be used to examine large hoist shafts and other critical parts.





Faster Cold-Weather Starting For Engines

WINTER TEMPERATURES, down to —65 deg. F., long a bugaboo for gasoline and diesel engines, may be whipped by two devices for quick starting at low temperatures.

For Diesel Engines: After preheating from 25 to 75 minutes with a Stewart-Warner vehicle heater, a six-cylinder diesel engine can be started with less than one minute's cranking, introduces clean air, heated to about 400 deg. F., into the interior of the engine through a preheater which warms the air and fuel vapor and prevents condensation on manifold and combustion chamber walls.

Heating the lubricating oil to provide normal lubrication when the engine starts, is accomplished by a heat exchanger built into or around the sump. Heater exhaust or the 400 deg. air supplies heat.

For Gasoline Engines: A new device, the gasifier, according to a U.S. Army release, enables gasoline engines to start in less than 30 seconds in temperatures as low as —65 deg. F., without use of an external heating source. Developed by Robert Reichhelm Co., Stratford, Conn.

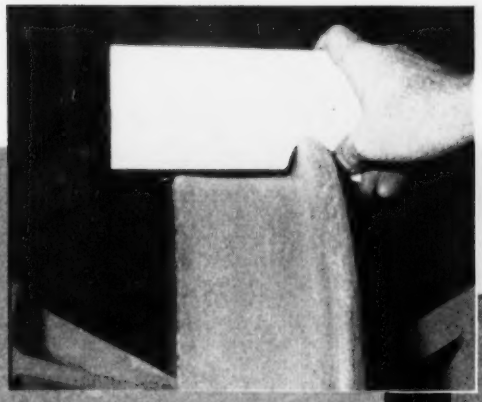
The gasifier supplements the carburetor for starting only. It is essentially a fuel pre-combustion chamber with a spark plug. A part of the fuel supplied is burned under controlled conditions to heat and vaporize the main portion. The resultant rich, warm, gaseous priming charge is sucked into the engine upon cranking to aid combustion independent of carburetor action.

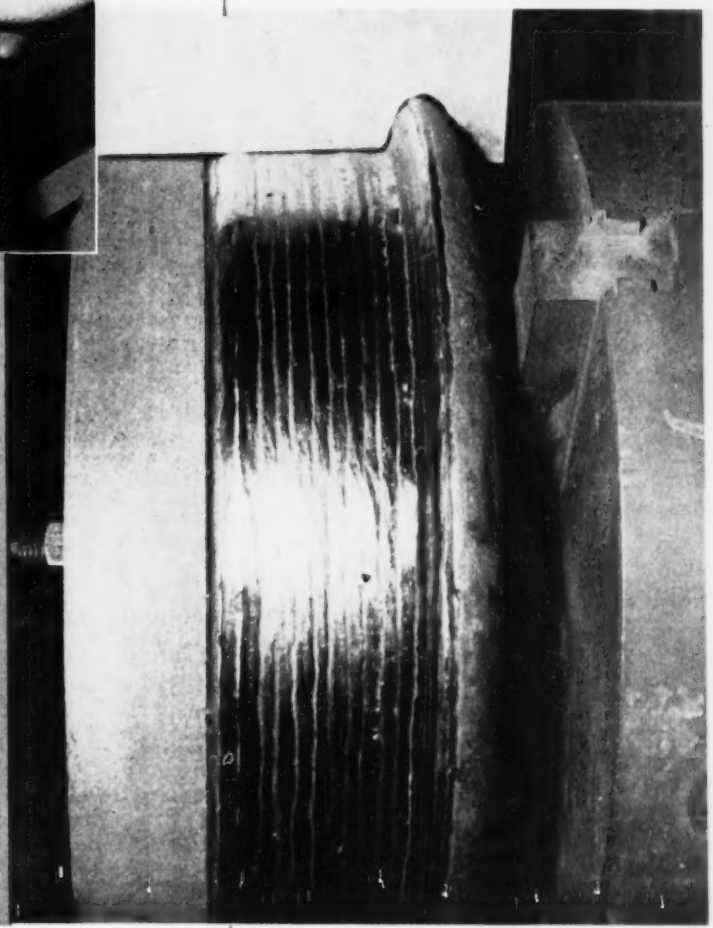
Adequate cranking power is necessary for successful operation, and Arctic lubricants of low viscosity must be used in the crank case.

Mine Car Wheels
get a lift with
STOODY 104

CAST STEEL MINE CAR AND LOCOMOTIVE WHEELS are easily salvaged from the scrap heap—or better yet, prevented from reaching the scrap pile, by systematic hard-facing. The job is not costly if done by automatic equipment and life of hard-faced wheels will usually equal or exceed new equipment.

Top, Left: *Template shows degree of wear.*
Bottom: *Stoody 104 applied automatically restores size.*





RECOMMENDED PROCEDURE—

Back up the wheel face opposite the flange with a carbon disc or tack-weld a strip of sheet metal to retain the flux. Apply STOODY 104 automatically across worn wheel surface, including flange. Wheels should be built up before wearing more than ¼". After building-up, deposits are rough-machined. Where abrasion is extreme, a final pass of Stoody 107 adds extra wear resistance.

A list of custom shops equipped for automatic welding will be supplied on request or ask your Stoody dealer, listed in most cities in the Classified Yellow Directory.

Note: *Welding of cast iron wheels is not recommended.*

STOODY COMPANY

11940 EAST SLAUSON AVENUE, WHITTIER, CALIF.

"Best Sellers" of 1952

(From Monthly Column, "For Your Files")

Materials Handling

MATERIALS HANDLING. Pettibone Mulliken Corp.'s (Chicago, Ill.) claim to "the world's most complete line of material handling and processing equipment" is supported by this 36-page catalog of their equipment in action, plus operating details.

CONVEYOR BELT REPAIR. "Magic-Vulc," a self-(cold)-curing plastic rubber compound offers a practical low cost way to repair conveyor belts according to the manufacturers, Magic Chemical Co., Brockton, Mass. Interesting folder shows how easy it is to apply.

CONVEYORS, ELEVATORS. Photographs, typical layout drawings, engineering data, calculation tables, charts and formulas fill this 28-page Book No. 2475 on Bulk-Flo conveyors and elevators made by Link-Belt Co., Chicago, Ill.

FEEDERS AND CONVEYORS. A comprehensive booklet, well illustrated with diagrams and photographs, Catalog 830 is packed with information about Jeffrey-Traylor electric vibrating feeders and conveyors made by Jeffrey Mfg. Co., Columbus, Ohio.

TRUCKING COSTS. "Estimating Production and Costs of Material Movement with Euclids" is an attractive book containing many useful charts, illustrations, formulas and reference tables. Although intended for making estimates for Euclid equipment, estimating methods and formulas can be applied to equipment of other makes. Euclid Road Machinery Co., Cleveland, Ohio.

Power and Transmission

BATTERIES. Here's a wealth of material on selecting, handling, charging, and maintaining batteries in the mine. Four folders full of information, part of Gould-National Batteries, Inc. (Trenton, N. J.), Plus-Performance Plan, contain reprints, charts and bulletins. The titles are self-explanatory:

Charging and Handling

Selecting Batteries

Determining Battery Condition

BATTERY. You'll want to read all about this new type battery that uses Varlenite sheets between the plates to form a compressed porous cushion like a cake. Varlenite holds 75% of its volume in electrolyte and thus stays wet as long as any water remains in the battery. This means battery plates can be made full length and there is no free acid splashed out to cause corrosion. An interesting booklet on the Varley storage battery is available from Chicago Forging and Mfg. Co., Chicago, Ill.

50-MILLION HORSEPOWER. Detroit Diesel Engine Division, General Motors Corp., Detroit 28, Mich., has produced enough diesel engines since 1937 to total about 50-million rated horsepower. This is explained in a useful little pamphlet also showing applications of Detroit diesels in mines, earth-moving operations, transportation units, oil well drilling, etc.

V-DRIVE SELECTION GUIDE. Selection of proper V-belt drive can be made quickly and accurately with the aid offered by the Fort Worth Steel & Machinery Co., Fort Worth, Tex., in their Engineering Guide #50-A. The simple formulas are augmented by tables.

LIQUID DRIVES. Fluid drive units for almost every application are discussed with performance charts and tables as well as diagrams in bulletin offered by G. E. Nelson Co., Liquid Drive Div., Holly, Mich.

Drilling and Blasting

DRILL BITS. Some unusual bits for several types of mining tools are illustrated and described in a catalog released by Firth Sterling, Pittsburgh, Pa.

COMBINATION DRILL offers all three drilling methods, auger, rotary and percussion, on one rig. "Mobile Drill" has a hydraulic feed, telescoping mast. Maximum depth for auger drilling without water is 150 ft.; for rotary drilling with water, over 300 ft. Can be jeep-mounted. Mobile Drilling Co., Indianapolis, Ind.

DETACHABLE DRILL BITS. Here are four pages crammed full of information about the new Liddicoat detachable drill bit made by Wolverine Tube Div., Calumet and Hecla Consolidated Copper Co., Detroit, Mich.

DIAMOND BITS. The last word on Sprague & Henwood, Inc. (Scranton, Pa.), coring and non-coring diamond bits. Should be in your files if you are concerned in any way with diamond drilling.

LONG-HOLE DRILLING. How to drill long holes, from 20 to 150 ft., with tungsten carbide "Rok-Bits," long hole drilling tools, and standard percussion type drills, is covered in a four-page bulletin offered by Rock Bit Sales and Service Co., Philadelphia, Pa. Holes can be drilled in any type rock, in any direction, in two standard sizes, 1⅞ and 3 in., says the manufacturer.

MILLI-SECOND DELAYS. Atlas Powder Co., Wilmington, Del., releases a new 20-page manual describing and illustrating eight methods of blasting in quarries with milli-second delays. The manual contains new "machine-gun" photographs to illustrate progressive and alternate milli-second delay techniques. Sketches explain why the Rockmaster "16" blasting system gives better breakage, less vibration, reduced air blast, less back-break, and better toe action. This is a "must" for your blasting files.

Roof Support

ROOF BOLTING. The September issue of Ohio Brass Co.'s "Haulage Ways" amounted to a roof-bolting manual. Subjects covered are current techniques, accessories, testing installed bolts, use of hole gage, and equipment in use.

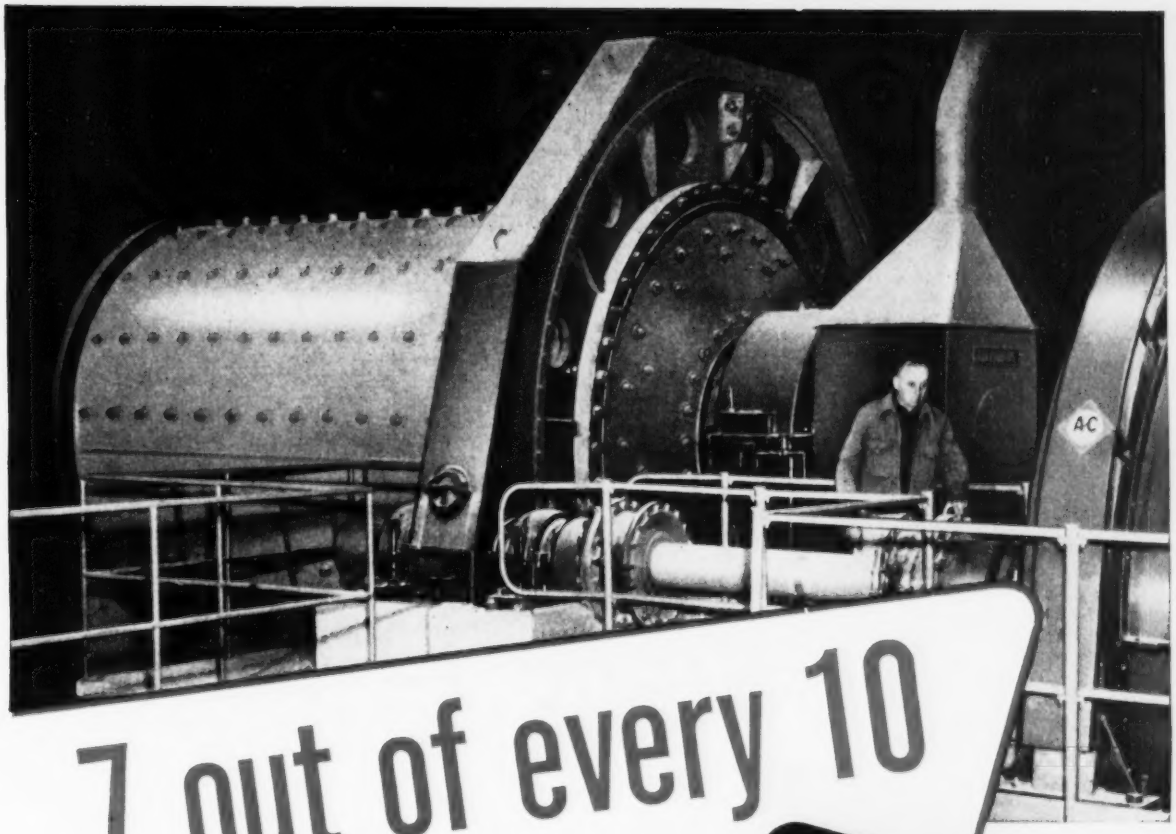
WOOD PRESERVATION MANUAL. Here's your chance to get the latest information and advice on wood preservation. (With present timber prices higher than a kite, you can't afford to overlook this one.) "The American Wood Preservers' Association Manual of Recommended Practice." AWPA headquarters are in Washington 6, D. C.

Pumps and Piping

JET PUMPS. A wide variety of jet pumps including ejectors, eductors, exhausters, and syphons is offered by Penberthy Injector Co., Detroit 2, Mich. This equipment is used for filtering under a vacuum, handling condensate, washing sand, agitating liquids, conveying ash and dust, atomizing, pumping sand and mud, mixing liquids, circulating solutions, and blowing filter beds. Penberthy injectors are installed in the following equipment: air conditioners, water softeners, aerators, agitators, sprayers, sand blasters, and vacuum filters. The new Bulletin No. 512, covering this complete line is worth study for applications in the mining industry.

PLASTIC PIPE. Light weight, high corrosion resistance, ease in handling and storing, ease of installation, are listed as advantages of Johnsonite No. 4 plastic pipe which is described fully in catalog 354 from Johnson Plastic Corp., Chagrin Falls, Ohio.

A NEW RUBBER LINER. "Linatex" is the name of a new highly resilient latex rubber product made by Linatex Corporation of America, Rockville, Conn. Linatex comes in 4x50-ft. sheets 1/32 to ½-in. thick. It has been used successfully to line pump impellers, pump casings, wood and metal tanks, pipe lines and valves, conveyor belts and pulleys, ore skips, chutes and launders, fans and ducts, and as an anti-shock and anti-vibration mount-



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OPERATING MEN who have had actual experience with Allis-Chalmers grinding mills will usually specify A-C mills again... as proved by our sales records.

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Ask the Allis-Chalmers representative in your area about the many high output and low maintenance advantages of Allis-Chalmers grinding mills. Or write for Grinding Mill Bulletin 07B6718A. Allis-Chalmers, Milwaukee 1, Wisconsin. A-3845

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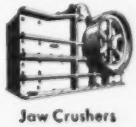
Jaw Crushers

Gyratory Crushers

Grinding Mills

Kilns, Coolers, Dryers

ing for heavy equipment. It has also been used to handle acids, alkalies, and cyanide solutions in gold mills, paper mills, and acid plants. Special cements to bond the Linatex to various equipment surfaces are mentioned in a pamphlet released on this new product.

RUBBER IN MINING. The British Rubber Development Board has just announced the free distribution of a new book, "Rubber in Mining," covering the properties of rubber as an engineering material, applications of rubber in exploration and rock breaking, applications in transport, and rubber in the treatment plant.

Wire Rope

WIRE ROPE. Here are 72 pages of practical information on proper methods of handling, reeving, breaking in, splicing, cutting, lubricating and specifying wire rope, 50 illustrations, 32 diagrams and charts. Get your copy of "Use and Care of Wire Rope," from A. Leschen & Sons Rope Co., St. Louis, Mo.

WIRE ROPE. Here's a handy pocket-size book just loaded with information about wire rope in general and MacWhyte wire rope in particular. This is the Ninth Edition of this popular catalog put out by MacWhyte Co., Kenosha, Wis.

Safety and Ventilation

SAFETY. "The Story of Safety" is must reading for all mine and plant safety men as well as management. Not only is there a lot of "how to" in this story of Du Pont's safety program, but there is a new approach to the safety problem with analysis and interpretation. Published by E. I. Du Pont De Nemours & Co., Wilmington, Del.

SAFETY EQUIPMENT. This 155-page tome runs the gamut of safety equipment from "Anti-Fogging Compound" to "Wurkshus, Rubber." If you are concerned at all with safety equipment for your company's employees, you should get your copy of Bulletin 100 from Boyer-Campbell Co., Detroit, Mich.

GIANT FOG NOZZLE. A new giant for nozzle capable of delivering a 500-gpm fog blanket with a large diameter and effective reach of about 80 ft. is announced by the Bete Fog Nozzle, Inc., Greenfield, Mass. Tremendous cooling effect of this large volume of fog will almost instantaneously put out large flammable liquid fires, and others. Small stones, bits of hose, etc., pass freely through the nozzle without clogging it.

AIR MOVER. Mines Safety Appliances Co., Pittsburgh 8, Pa., introduces a new air moving unit which operates on compressed air or steam. Pressure of compressed air or steam is used to induce a large flow of free air through a venturi-like horn-shaped tube with bell inlet. Ideal for blowing out gassy mine air from isolated sections, removing toxic fumes from metallurgical plants, removing dust-laden air from rooms, etc.

FANS. Here is a catalog, price sheet and engineering bulletin describing 30 fan types in over 300 sizes. Included are specifications, installation diagrams and photographs plus extensive information for proper selection of fans for almost any use. Chelsea Fan & Blower Co., Inc., Plainfield, N. J.

For more information on these products write New Products Editor E&MJ 330 W. 42nd St., N. Y. 36, N. Y.

Maintenance

PLANT MAINTENANCE. Plant look run-down? Here's a bulletin on special coatings for plant maintenance which describes the use of various industrial products for problems like skidproofing, rust prevention, painting over damp areas, weatherproofing and decorating exterior masonry, interior waterproofing, painting over hot surfaces, protection against acid and chemical fumes. United Laboratories Inc., Cleveland 12, Ohio.

LONG - WEARING MACHINE PARTS. Long-wearing machine parts made of Haynes alloys are described and illustrated in a new booklet by the Haynes Stellite Co., Division of Union Carbide and Carbon Corp., Kokomo, Ind. Parts included are bushings, lathe centers, rollers, wear strips, knives, valve parts, gages, guide rollers, rods, pistons, plungers.

HARDSURFACING. "What Hardsurfacing Can Do for You" is the provocative title of a catalog issued by Rankin Mfg. Co., Los Angeles, Calif. It contains specific information on hardfacing procedures and indicates the savings to be effected by the use of hardsurfacing over part replacement.

HOW TO WELD IT BETTER. This is the title of a useful booklet issued by Eutectic Welding Alloys Corp., Flushing 58, New York, N. Y., which has been prepared for coal mine maintenance, but is equally useful for metal mining.

WELDING DIRECTORY. Eutectic Welding Alloys Corp., New York, N. Y., has released a new welding directory covering a complete line of welding products and their application. A handy chart is included which tells what type of rod to use on each of a large number of metals and alloys.

HYDRAULIC TOOLS. "1001 Valuable Shortcuts with Hydraulic Tools and Hand Tools" constitutes the 64-page "Idea Book" available from Blackhawk Mfg. Co., Milwaukee, Wisc. No matter what your plant or mine job is, 5 will get you 10 you'll get a flock of good ideas out of this.

SAWS AND FILES. "How to choose and use tools for longer tool life" is the theme of the Disston saw, tool and file manual issued by Henry Disston & Sons, Inc., Philadelphia, Pa. Handsaws, band saws, files, rasps, trowels and what-have-you, are discussed in this manual. It also covers the equipment for keeping such tools in shape.

"KNOW YOUR CARBURETOR." This illustrated booklet is pointed particularly to the man who has not had extensive training in carburetor servicing. It describes in nontechnical language the basic theory of the carburetor, its various parts, and the common carburetor troubles usually encountered and how to correct them. Pennsylvania Refining Co., Cleveland, Ohio.

Mineral Dressing

MINERAL DRESSING BIBLIOGRAPHY. A must for millmen is the Dow Chemical Co. annual bibliography covering flotation research, mineral dressing equipment and processes. Heavy-Media-Separation, and literature on milling operations in general, indexed by company or plant name.

WEIGHING AND BATCHING. Complete equipment for weighing, batching, and proportioning are covered in a comprehensive Catalog No. 841 describing Jeffrey-Traylor equipment offered by the Jeffrey Manufacturing Co., Columbus 16, Ohio. More than 75 items are listed in the index of this catalog including feeders, conveyors, grinders, grizzlies, magnetic separators, scraper conveyors, etc. We predict that you will find plenty to study in this catalog.

WEIGHING, BATCHING, PROPORTIONING, Catalog 841 contains 58 pages of pictures, data and descriptions of equipment that come under the headings of weighing, batching and proportioning, made by Jeffrey Mfg. Co., Columbus, Ohio.

VIBRATOR. "Vibrolator" is a device that produces vibration for your bins and hoppers by using the principle rotation instead of reciprocation. A steel ball spun around and around its two-rail race inside a housing at high speed by compressed air, generates a number of powerful, all-direction vibrations. Only one moving part. This bulletin from Martin Engineering Co., Kewanee, Ill., describes this new development in vibrators and discusses its advantages.

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CRUSHER SELECTION. To assist "the man who, sometime, may want to select a crusher," Pennsylvania Crusher Co., Philadelphia, Pa., has prepared a handbook that explains in non-technical manner the various crushing methods and where they apply in crushing procedure.

HAMMER MILL. A new unit—the "Pulverator"—is announced by Allis-Chalmers, Milwaukee 1, Wis., in an interesting booklet containing specification drawings, cut-away illustrations, performance data, and a discussion of operating principles.

CONTINUOUS GRINDING. This is the title of a new 28-page catalog by Patterson Foundry & Machinery Co., East Liverpool, Ohio, describing a complete line of ball, tube, and rod mills for wet or dry, fine or coarse grinding. Numerous installation drawings and technical tables are included.

HEATED VIBRATING SCREEN. It is no longer necessary to pound, brush, or flame-heat vibrating screens which have become blinded by fine moist particles—not if you use Allis-Chalmers' new "Thermo-Deck" heating unit for vibrating screens which eliminates blinding of medium or fine screen cloth. Heat is generated in the screen through electric current feeding from bus bars on either side of the vibrating screen deck. Operators report that screen cloth has been increased 300% through the use of this electrical heating device.

WIRE CLOTH. Here is an excellent 125-page book that not only does a thorough job of cataloging wire and filter cloth made by the Multi-Metal Wire Cloth Co. (New York, N. Y.), but provides sections on research into wire and filter cloth structures and a set of relevant technical data that give it a handbook value. Generous amounts of photographs, drawings and tables give the engineer plenty of help.

CYCLONE CLASSIFIER. Your file on classifiers will not be complete until you get this neatly illustrated bulletin telling how the DorrClone classifying unit works, where it can be used, and what it will do. It is made by the Dorr Co., Stamford, Conn.

MINERAL JIG. A self-contained unit consisting of cells, screen baskets, and a completely enclosed "package drive" is discussed in detail in a four-page folder published by Yuba Mfg. Co., San Francisco, Calif., on their M-8 42 x 42-in. mineral jig.

MAGNETIC SEPARATORS. Jeffrey Manufacturing Co., Columbus 16, Ohio, has released a new catalog covering its complete line of magnetic cobbers, counter-glow magnetic separators and separators for Heavy-Media plants.

pH AND CONDUCTIVITY RECORDERS. A new 40-page catalog covering pH, oxidation-reduction potential, and electrolytic conductivity recorders and controllers is offered by Minneapolis-Honeywell Regulator Co., Philadelphia 44, Pa.

pH CONTROL. A review of pH theory and its practical applications in industrial measurement and control, are contained in Bulletin 430-1, issued by Foxboro Co., Foxboro, Mass. The 16-page booklet is profusely illustrated to show details and accessory equipment.

IMPROVED FLOTATION RECOVERY. How conditioning efficiency increases flotation recovery is the subject of a bulletin released by Denver Equipment Co., Denver, Colo. Bulletin states the case for the Denver Super-Agitator and Conditioner.

SPRAY NOZZLES. Anyone interested in spray nozzles for washing sand, coal, ore, concentrates, or for any other mine or quarry application, will find a wealth of information in a new 40-page Industrial Nozzle bulletin just published by Binks Mfg. Co., Chicago, Ill.

THICKENERS. Major types of Dorr thickeners are illustrated and described in a bulletin in color released by the Dorr Co., Stamford, Conn. You will want this booklet for your mill reference file. Both single-compartment and tray-type thickeners are illustrated in photographs and line drawings, and special devices such as the automatic overload arm, the torque recorder, and the motorized lifting arm are covered in detail.

CENTRIFUGAL FILTER. Operating principles of the Bird Centrifugal Filter are clearly shown and explained in a recent bulletin published by the Bird Machine Co., South Walpole, Mass. Solids handled by this unit vary from a fraction of a micron to ½ in. or coarser. Solids through-put may range from 200 lb. to 60 tons or more per hour, and clarified liquor may range from 1 or 2 gal. to 400 gal. or more per hour. Power requirements range from 2 to 5 kw. per ton of processed solids. Possible applications listed include flotation concentrates, iron ore, lime, sodium nitrate, sulphur, tin ore, manganese ore, and many others.

DRIERS. There's a lot of information on the drying, cooling and processing of bulk materials in the 24-page book No. 2409, on Multi-Louvre driers, issued by Link-Belt Co., Chicago, Ill. The unit itself is widely used, according to the manufacturer, where fast treatment and accurate temperature control are required.

Miscellaneous

HOW TO IDENTIFY METALS. As a valuable contribution to assist in the recovery of strategic metals from scrap, International Nickel Co. has issued a handbook which enables you to identify a large number of metals and alloys. The system described resembles that used in determinative mineralogy. You start with a magnet and four or five reagents, and by following a carefully outlined scheme, you will be able to tell whether a sample contains aluminum, magnesium, copper, nickel, or any other of a long list of metals or alloys. INCO is to be congratulated for this fine contribution to the defense effort. The book is free.

ALNICO PERMANENT MAGNETS. A complete list of stocked sizes and shapes of Carboloy Alnico permanent magnets is included in Bulletin PM-100 from the Carboloy Department of General Electric Co., Detroit 32, Mich.

RESEARCH. Two booklets, "Research in Engineering Economics," and "Research in Production Engineering" show you how Battelle Memorial Institute stands ready to serve you in both those fields.

AERIAL SURVEYS. A new booklet "Aerial Surveys and Maps from Photographs" in simple nontechnical language is published by Abrams Aerial Survey Corp., Lansing 1, Mich.

GAS AND LIQUID ANALYZER. For rapid automatic analysis of fluid mixtures, precise control of continuous or batch-type processes, and accurate measurement of toxic contaminants in atmospheres, Mine Safety Appliances Co. offers the MSA infra-red gas and liquid analyzer and tells you all about it in Bulletin No. 0705-1.

STEREOMICROSCOPE. Catalog tells you all about this new microscope that gives you three-dimensional magnified images to help in interpretation. Details and applications are discussed and described. Bausch & Lomb Optical Co., Rochester, N. Y.

WHITE PRINTS. You can make black and white prints of drawings, tracings, letters, reports, etc., for less than 2¢ per sq. ft., and in as little as one minute. To find out how, send for a copy of Peck and Harvey Co.'s new bulletin on the subject. Address, Chicago 45, Ill.

BULLETINS. If you want to liven up your bulletin boards, catch the attention of your workers, send for this portfolio of illustrated flash bulletins. They are amusing and attention-getting for any kind of message to the men in mine or plant. Carr Speirs Corp., Stamford, Conn.

PURCHASING PROCEDURES. Are you bogged down by needless detail and missing facts? "Purchasing Procedures that Save Time and Money" may well show you how to solve your problems, simplify your present routine. The 20-page book is issued by Remington Rand, New York.

for BETTER, SAFER LIGHTING use...

JOY String-a-lite®

DURABLE • TROUBLEFREE • FOOLPROOF

Joy String-a-lite lines are of one-piece molded Neoprene construction—watertight, shatterproof, and age-resistant.

Oils, acids, alkalies or moisture have little effect on their life span or conducting efficiency.

Combinations can be easily installed, moved or varied, by untrained personnel, to fit the requirements of any mine lighting job.

FURNISHED IN VARIOUS LENGTHS WITH OUTLETS AT REGULAR INTERVALS, AS SPECIFIED

THREE LIGHT STYLES

EHS LAMP OUTLET

Snug fitting Neoprene lip at bulb neck seals out water, dirt and oil.

FSC SIDE OUTLET

Accommodates ERS "Plug-in" Socket or Hand Extension Lamps.

ERS PLUG-IN SOCKET

Converts FSC Side Outlet to Weather-Sealed light socket.

VEIS VAPOR-PROOF LIGHT

Has glass globe with sturdy metal guard, for protecting light bulb. 100 watt size.

SAFE POWER CONNECTIONS

241FR FEMALE RECEPTACLE

A power outlet, consisting of Neoprene insert in sturdy metal housing. No. LFR—same as above except with insert for engaging hand extension lights below.

AHBED EXTENSION

100′ of Neoprene covered cord with 241M Male and 241F Female Connectors, factory molded on ends.

241F POWER LEAD

Female Connector on cable length specified by customer. Other end open for wiring into power source.

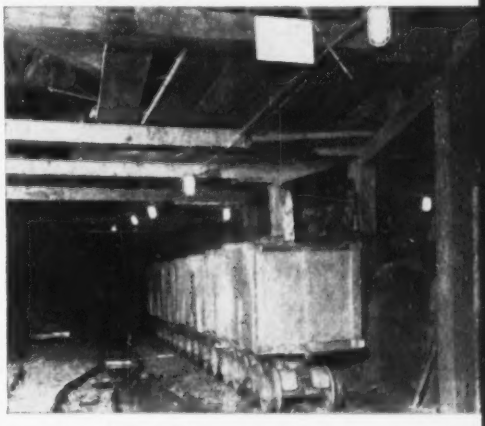
HAND EXTENSION LIGHTS

Choice of Weather-proof or Vapor-proof lamp styles molded to Neoprene covered cord with LMC Male end Connector. Accommodates up to 100-watt standard Edison based bulbs.

Cord Length	1—Vapor-proof	2—Weather-proof
25′	V5A	W5A
50′	V6A	W6A

JOY String-a-Lite installations at Chief Consolidated Mining Company, Eureka, Utah.

ABOVE—Photo illustrates convenience and safety of JOY Vapor-proof Lights in exceptionally wet working areas.



ABOVE—JOY VEIS Vaporproof String-a-lite illuminating an important haulage-way.

Write for your free copy of Bulletin SL-202 or Consult a Joy Engineer

W&D ME3565

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING • PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

THIS MONTH IN MINING

Lilienthal Sees Expansion In Nonmetallic Minerals

NEW PROCESSES leading to mushrooming new applications will trigger a growth of nonmetallic minerals production such as the petroleum industry experienced. That's the belief of David E. Lilienthal, former AEC chairman, and the motivation behind the recent acquisition on the part of Minerals Separation North American Corp. of the fullers earth assets of Attapulgus Clay Co. and formation of the successor company, Attapulgus Minerals & Chemicals Corp.

"I have a conviction," Lilienthal told *E&MJ*, "that adaptation of the nonmetallic minerals—such as clays, phosphates, and potash—to industrial uses is still in the primitive stage and offers a wide-open field for exploitation. I wouldn't be going into this if I didn't feel that way. I believe the status of these materials today may be roughly analogous to that of petroleum when we knew little about the chemistry of hydrocarbons. I believe we can multiply and expand these applications."

DAVID E. LILIENTHAL—He voices an optimistic conviction.

Mr. Lilienthal will direct the affairs of Attapulgus Minerals & Chemicals as board chairman.

The reorganization relegates the name Minerals Separation North American Corp. to the annals of the industry, where it is recorded with distinction for its leading rôle in development of the flotation process.

The new enterprise broadens the scope of activities in which Minerals Separation was engaged, to include manufacture and sale of products related to patents and licensing agreements in which the predecessor company dealt, thus hedging against the day when the patents should expire, and diversifies the predecessor company's research and development program. The change of name was recommended to better define the broader field in which the successor company will operate.

Minerals Separation developed various processes, chiefly for beneficiation of phosphate, potash, molybdenum and glass sand at its Carlsbad, N. M., and Lakeland, Fla., laboratories and provided technical assistance for concerns licensed to make use of the patents. At its Hibbing, Minn., laboratory, the company developed a process—patented but so far not licensed—for beneficiation of taconite and other low-grade iron ores.

Attapulgus Clay Co., said to have been the largest fullers earth producer in the country, maintained a laboratory at Camden, N. J., and held a 50% interest each in the Porocel Corp. (absorbed into the new corporate structure) and Filtrol Corp. (not acquired by the new company). Porocel, the other 50% of whose stock is held by American Cyanamid Co., is engaged in activation of bauxites for adsorbent and chemical uses at its Berger, Ark., plant. Attapulgus Minerals & Chemicals will be exclusive sales agent for Porocel. Capital stock of Attapulgus Clay was held by Atlantic Refining Co. (50%) Lazard Frères & Co. (25%) and F. Eberstadt & Co. (25%).

Minerals Separation increased its authorized capitalization from 500,000 to 1,200,000 shares of $1-par-value stock and issued 650,000 of the new shares, 600,000 in payment—together with $2.5-million in cash—for assets of Attapulgus Clay and 50,000 preempted in accordance with Mr. Lilienthal's employment contract. The contract includes an option for purchase at $4.87½% per share of 1/36 of the preempted shares in or after each of the 36 months in 1953, 1954, 1955.

To Minerals Separation's board of directors, the new company has added Frank A. Howard, former vice president of Standard Oil Company of New Jersey and retired president of Standard Oil Development Co., and Ernest K. Gladding, formerly in charge of development for E. I. duPont de Nemours & Co., Inc. Other directors are James S. Adams, partner of Lazard Frères & Co.; Nathan Greene, Lazard Frères counsel, and Mr. Lilienthal, who is a consultant for Lazard Frères.

Attapulgus Minerals & Chemicals officers are L. R. Streander, president; R. H. Hubbell, Jr., vice president in charge of sales; Dr. E. W. Greene, vice president in charge of the minerals Separation Division; and W. E. Sawyer, Jr., secretary and treasurer.

General offices will be at 210 W. Washington Sq., Philadelphia, Pa.

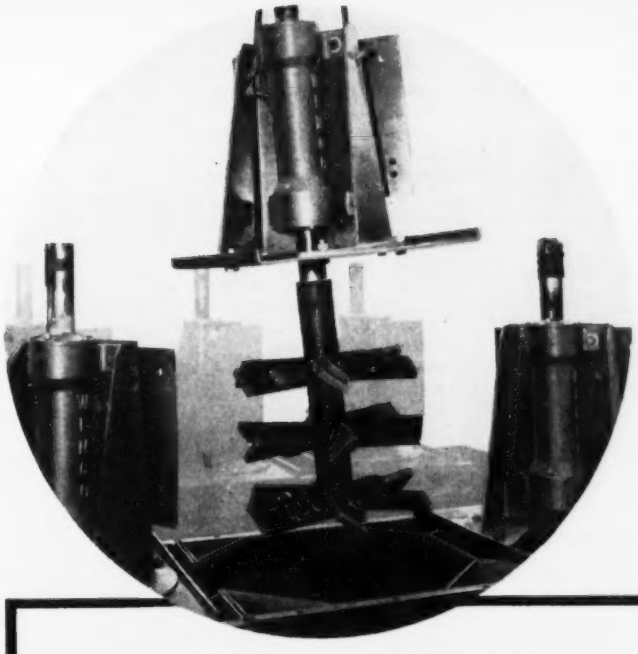
New Brunswick Scene of Big Mineral Find

A MASSIVE OREBODY discovered near Bathurst, New Brunswick, has been announced recently by the *Northern Miner*, which describes it as one of the "biggest finds in Canadian history." The property lies within a 5½-sq.-mi. concession held by Brunswick Mining & Smelting Co., headed by M. J. Boylen, who is credited with having pushed the exploration boom in this area.

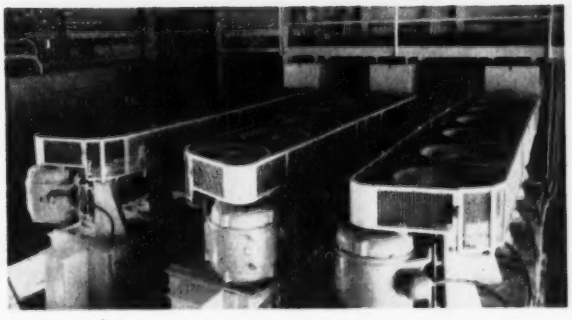
Diamond-drill holes, 200 ft. deep and still in ore, reveal a grade of ore at the 200-ft. horizon of 5.2% zinc, 1.61% lead, and 1.98 oz. of silver for an average width of 182 ft. and length of 1,150 ft.

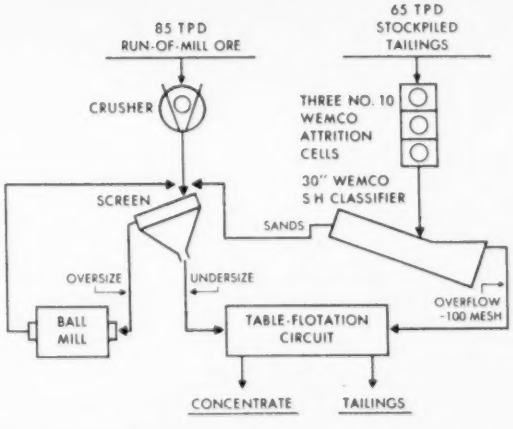
The Brunswick Mining & Smelting concession lies in the heart of a 25-mi. belt along which some 1,000 additional claims have been staked, virtually all in the name of the M. J. Boylen Nominee Account. Major claims blocks have since been acquired by Leadbridge Mining Co. (St. Joseph Lead Co. affiliate), Maritimes Mining Corp., Anacon Lead Mines, and others. The claim boundaries along this belt conform remarkably to anomalies which appeared on an aeromagnetic map published by the Geophysics Division of the Geologic Survey of Canada in 1951.

Now that this important development has been disclosed, it is expected that New Brunswick will occupy the mining spotlight and may be the scene of property consolidations, mine developments, and perhaps, in addition, a smelter.



40% *increased flotation recovery* WITH WEMCO ATTRITION MACHINES





RETREATMENT OF STOCKPILED TAILINGS

On this tungsten application note that use of Wemco Attrition Machines makes it possible to feed former tailings into the same flotation circuit as new run-of-mine ore, resulting in considerable added profit to this producer in terms of greater units of tungsten recovered.

Increased recoveries of critical tungsten minerals are now being made from materials rejected as tailings by various milling processes previously used at a Nevada tungsten mine (name on request).

By using Wemco Attrition Machines together with flotation, it is now possible to recover 92% of the tungsten values in this former reject material. Before addition of the attrition machines, flotation alone recovered only 64% of the tungsten. The greatly increased recovery after attritioning is due to removal of a stubborn oxide coating on the mineral particle surfaces, caused by weathering of the stockpiled material.

75% increased mill tonnage was made possible with the installation of Wemco Attrition Machines to treat 65 tons per day of former rejects.

The Wemco Attrition Machine was specially developed for this particular purpose. It operates on the principle of a mutual abrasion of particles in a thick pulp. In terms of removing slimes, oxide coatings and cementing materials from mineral particles, these units operate with greater efficiency and lower power consumption than grinding units and other general purpose machines that have sometimes been adapted for this purpose.

If you have a mineral dressing problem in which recovery is impaired by the surface condition of individual particles, the Wemco Attrition Machine can provide an answer to your problems.

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TEN-TON MEASURING POCKET, one of two which load the balanced skips, is inspected by D. R. Wagner, chief mining engineer.

Tennessee Copper Plans New Economies

EXPANSION AND DEVELOPMENT WORK now in progress at its Boyd mine at Ducktown, Tenn., will enable Tennessee Copper Co. to make additional mining economies and provide sufficient production for its ore processing and chemical plants. Completion of a new Central shaft for hoisting ore, thereby reducing haulage and hoistings costs, the provision of facilities for crushing ore underground, and the opening of five new stoping areas are comprised in the program.

Ore from the company's Boyd, Calloway, and Mary mines has been going to Burra Burra shaft and there hoisted to surface for crushing. The respective hauls from Calloway and Mary to Burra Burra are each about 9,000 ft., and that from Boyd about 4,000 ft. The corresponding hauls to the Central shaft will be 4,000 ft. each from Calloway and Mary mines and only 1,000 ft. from Boyd.

In addition, Burra Burra shaft can handle only 150 tph. This is enough for Burra Burra mine but hardly so for the expansion planned for the others. The Central shaft has a capacity of 400 tph. The reduction in hoisting cost, it is estimated, will be 50%.

Calloway and Mary mines are connected with Boyd at its 10th level by a 9x9-ft. haulage drift. Through this their respective ores will go to the dump and ore pass at the Central shaft, at the south end of Boyd. The pass feeds the new crusher on the 14th level of this shaft.

Cars are dumped into the ore pass by an air-operated rotary dump made by Differential Steel Car Co. The pass can store 1500 tons. From it the ore goes to a 100-ton surge bin which feeds the crusher.

Ore mined at Boyd and hauled on the 14th level will be dumped directly into the surge bin. Ten-ton Differential side-dump cars are hauled by a 7½-ton Greensburg battery locomotive on 42-in.-gage track laid with 60-lb. rails.

Ore from the bin goes via a 6x7-ft. Syntron dual unit vibrating feeder into the crusher, a 48x60-in. deep-frame Birdsboro jaw crusher set to 5 in. The crushed product drops into a 2,500-ton storage pocket from which it is fed into 10-ton measuring pockets.

To handle the occasional large piece an adjustable brow was designed for the bin opening. This brow has hinged sections that can be tilted forward by air cylinders to pass the coarse material.

Central shaft is equipped with a Nordberg double-drum hoist, manually operated and powered by a 1,000-hp., ac, General Electric motor. Distance hoisted is 1,400 ft. The two 10-ton skips which work in balance, are the company's own design of the Kimberly type.

Ore is hoisted to a 2,400-ton bin on surface. From this it is loaded by gravity into railroad cars for shipment to the flotation plant.

An operating crew of three has been planned for the hoisting at Central shaft. It consists of a crusher man, the skip conductor, and the hoist engineer.

An important phase of the work is the 100-ft. vertical raise that has been driven from the 11th to 10th level, constituting the ore pass from the Central dump on to the crusher. This was a prelude to a 400-ft. vertical raise which is to be driven at the north end of Boyd to extend the man shaft there to the lower level. This new project will give the company a man shaft at each of its mines and will result in a saving of at least 30 minutes in getting men to the ore faces.

Aluminum Program Strides Ahead

TWO BIG STEPS toward accelerated aluminum production in the U. S. were taken recently, Harvey Machine Co., of Torrance, Calif., and Reynolds Metals Co. providing the action.

Harvey Machine obtained DPA approval of its projected $65-million aluminum reduction plant. The plant, to be built at The Dalles, Ore., will have capacity to produce 54,000 tons of aluminum a year.

Certification included allocation of 40,000 kw. of firm power, 20,000 of junior firm power, and 60,000 of interruptible power, available in 1954 when the plant is scheduled for completion. Should there be a shortage of hydroelectric power, a contingency that's not expected to arise, the company would be committed to share cost of constructing a steam power plant. Morgan Dubrow, manager of Bonneville Power Administration, pointed out that additional power capacity will be available before Harvey Machine's new plant gets into operation.

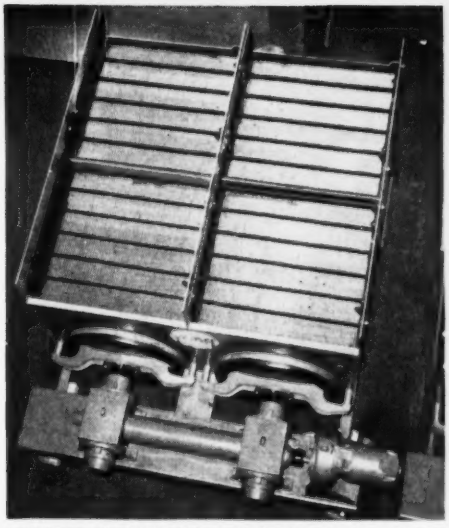
Rehabilitation and improved operation of bauxite mining works in British Guiana has been under study of Dr. J. H. Moses, chief geologist of Reynolds Mining Corp., and R. H. Zeglin, who will manage the plant in behalf of Reynolds Metals Co. Reynolds Metals recently acquired the property in taking title to all assets of Berbice Co., Ltd., a subsidiary of American Cyanamid Co.

"Reynolds has entered into a 29-year contract to supply alumina requirements of the Anaconda Copper Co.," said Walter L. Rice, president of Reynolds Mining Corp., "and the capacity of the plant . . . will assure a substantial part of the bauxite needed for this purpose." He said the local government had approved transfer of Berbice's three mining leases aggregating 6,254 acres and a 99-year lease on a 2,040-acre plant site and had granted permission to Reynolds exclusively to explore over a territory covering 482,210 acres, with options.

Property acquired includes power shovels, turnadozers, caterpillars, bulldozers, compressors, a road grader, a Euclid earth loader, a camp with accommodations for 600, 11 staff houses, washing plant, drying plant, repair shop, machine and electric shop, hospital, powerhouse, warehouse, office building, chemical laboratory, a railroad, nine barges, and three tugboats.

Long-wearing, rugged parts of U·S·S Stainless Steel help to assure uninterrupted operation of Yuba Mineral Jigs

YUBA CONSOLIDATED GOLD FIELDS' dredge number 20 is shown in operation at Hammonton, Calif.



TOP VIEW of a Yuba Mineral Jig showing four Stainless Steel screens each approximately 42" square.

A CONTINUOUS FLOW of muddy water passes over the screens of Yuba Mineral Jigs, as usable material is separated from refuse.

● The constant flow of water containing abrasive materials provides a severe test for resistance to wear and corrosion for mineral jigs—one of the important machines on placer mining dredges.

Yuba Manufacturing Company, San Francisco, Calif., has solved the combined problems of abrasion and corrosion by using U·S·S Stainless Steel for screens, diaphragm bands and hutch valve bodies. Yuba has been using U·S·S Stainless Steel in its jigs for more than six years and, company officials say, "they practically never wear out and none have been replaced as yet."

While rapid wear is induced by abrasive materials, corrosion is the factor that precludes the use of metals other than Stainless Steel. For instance, the rapid corrosion rate of carbon steel causes blinding of the screen openings, resulting in down time for cleaning or replacement. Dredges operating in far away places, such as Malaya, Alaska and Portugal must be built of parts and materials that will not require frequent replacements.

Stainless Steel's ability to resist both abrasion and corrosion make it highly suitable for many other jobs in the mining industry. You can reduce replacements and minimize shutdowns at key points in your equipment by replacing less durable materials with U·S·S Stainless Steel. If you would like more information relating to a particular application, write to United States Steel Corporation, Room 2809Q, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

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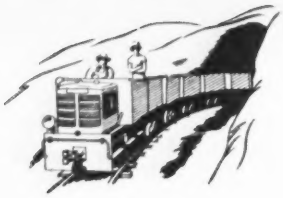

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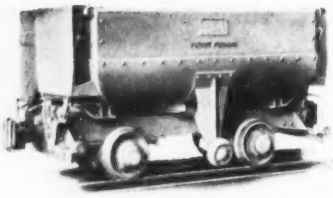
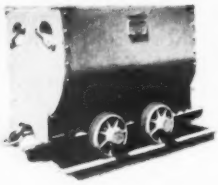
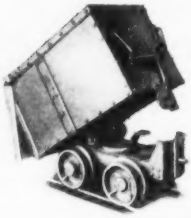


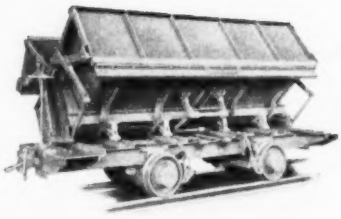
Granby car with rounded corners at bottom, joining ends and side



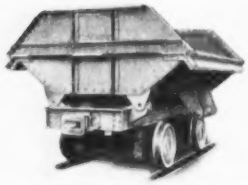
U-Body Mining Tub of 17 to 27 cu. ft. capacity



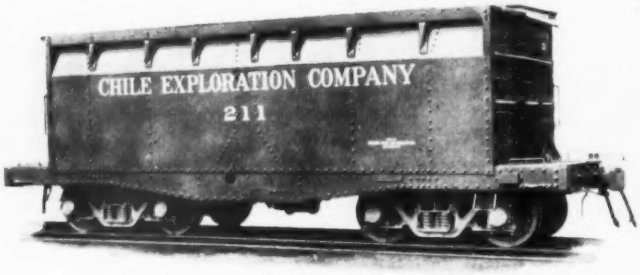
3-Way Dump Ore Mine car mounted on steel turntable.



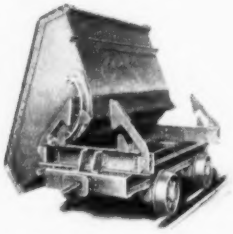
Large capacity Square Box Side Dump car of narrow width and low height.



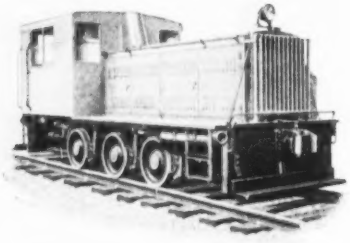
Troy type Dump car, trussed style body end construction with sandwich type floor



140,000 lb. capacity steel Ore car with sandwich type steel and wood floor



Low Loading Rocker Dump car suitable for hand or shovel loading



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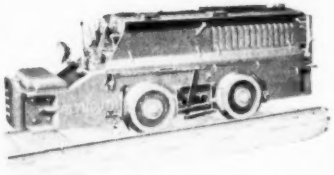
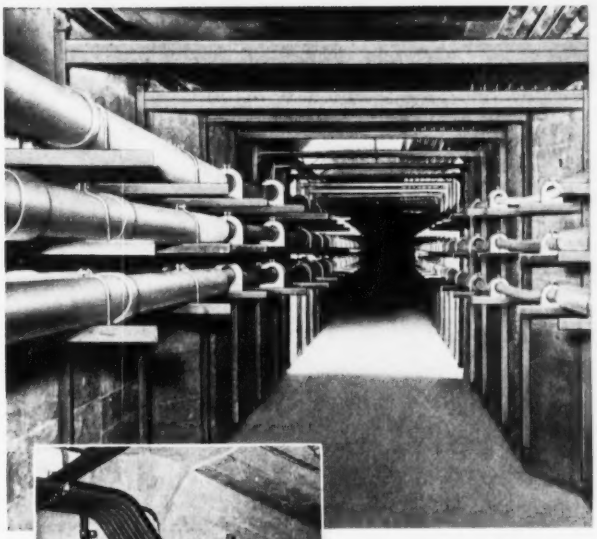
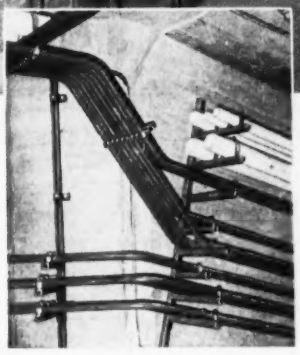


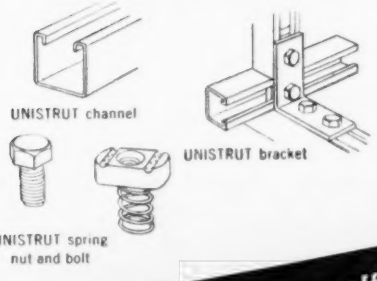
Mining Locomotives with low center of gravity and short wheel base

PRESSED STEEL CAR





Unistrut metal framing can be used as a support for power cables, as shown above, and for practically every rack and shelving installation. Unistrut requires no hole drilling, no welding—is 100% adjustable and is 100% re-usable.



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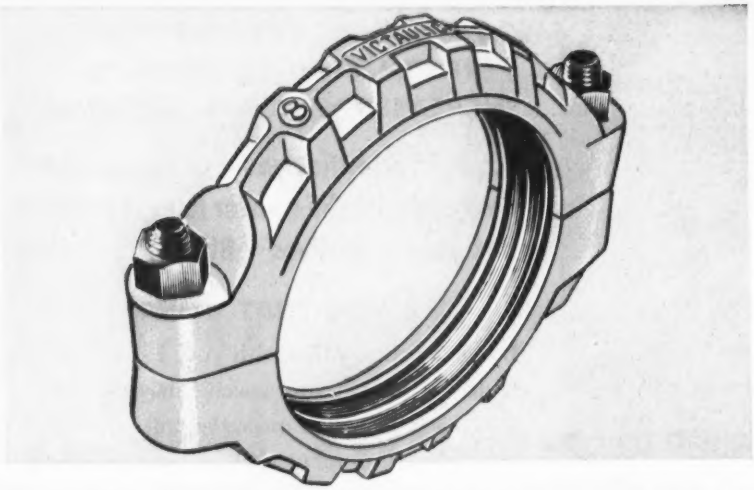

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News Briefs

Canada, traditionally an iron-poor country, is now producing iron ore just about rapidly enough to supply domestic needs and is accelerating output so rapidly that M. S. Fotheringham, president of Steep Rock Iron Mines, Ltd., has predicted that "within a very few years" there will be "a growing surplus for export." He looks for it to come from Steep Rock, Michipicoten, Eastern Ontario, Quebec, Labrador, and Newfoundland.

★ ★ ★

Iron Ore Company of Canada had pushed inland 108 mi. from Seven Isles with its rail line to the Ungava iron deposits by the first of the year, hoped to lay another 26 mi. of track in January and stockpile materials at the 134-mi. marker for further construction in the spring.

★ ★ ★

Effective the first of the year, U. S. Steel Co., its assets and obligations, were absorbed by U. S. Steel Corp. One effect is that Oliver Iron Mining Division now operates as a division of U. S. Steel Corp. rather than as a division of U. S. Steel Co., as heretofore.

★ ★ ★

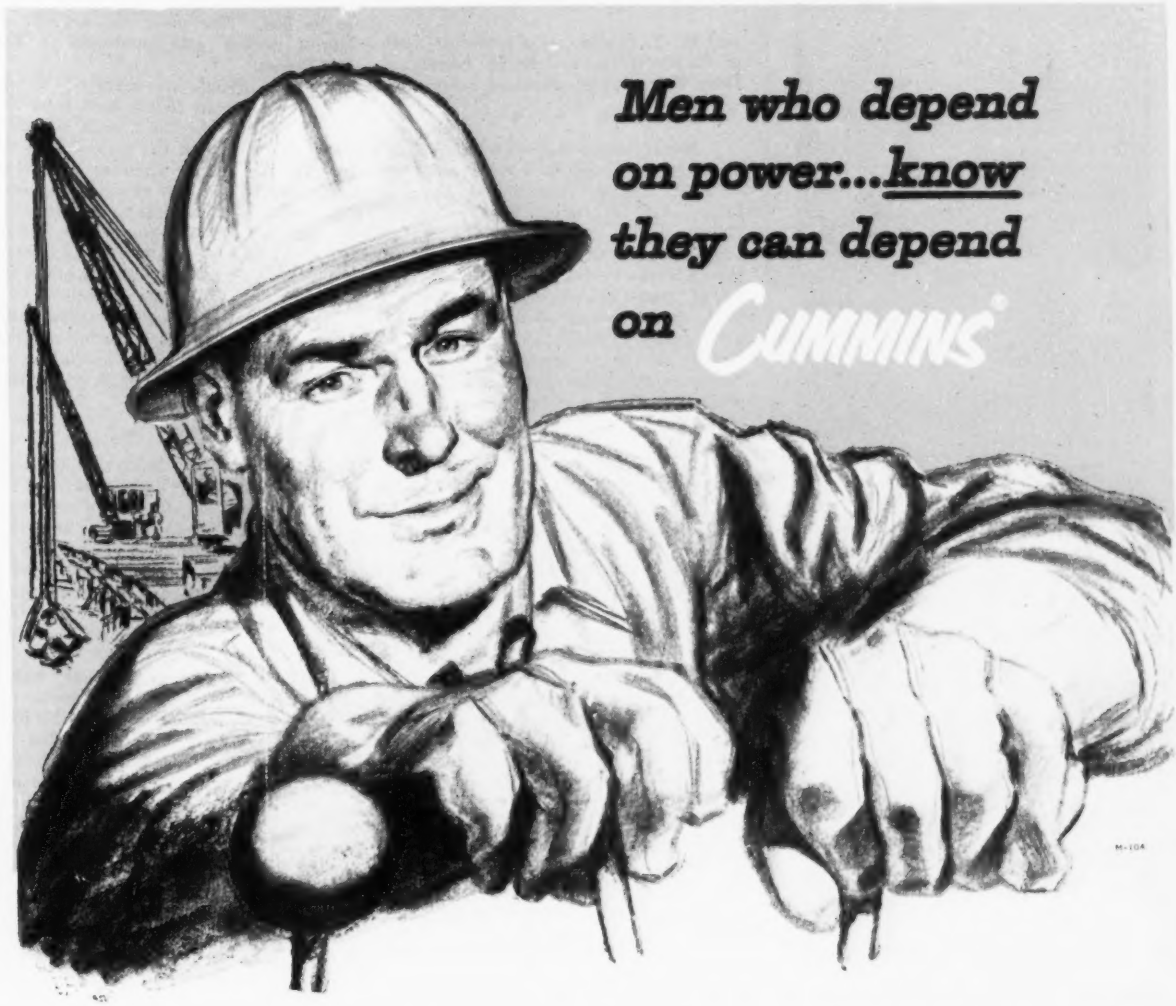
Burton Drilling Co., of Houston, Tex., will use the electro-log to probe for sulphur, oil, and other minerals in sands of the eastern lowlands of North Carolina on property leased from Coastal Plains Co., of Kingston, N. C. Drilling is scheduled initially in the Hoffman forest, in Jones and Onslow Counties, and in the Holy Shelter Pocosin. The state, which retains title to the lands, is to receive one-eighth of either net revenues or mineral output.

★ ★ ★

Still in an early preliminary phase is prospecting for commercial-grade phosphate rock in Southern Rhodesia, for development of which the local government recently granted an option to African Explosives and Chemical Industries, jointly owned by Imperial Chemical Industries and DeBeers Consolidated Mines. Any success would tend to offset Great Britain's dependence upon French North Africa for the mineral.

★ ★ ★

Charles A. Steen, 33-year-old prospector who couldn't raise enough capital to operate in the orthodox way, sunk a 75-ft. shaft in San Juan County, 9 mi. from LaSal, Utah, and 8 mi. from the Colorado border, and struck an 8-ft.-thick stratum containing pitchblende and what the *Houston Chronicle* called $1-million worth of uranium. To mine it, he formed Utex Exploration, Inc., in which he and his mother, Mrs. Rosalie Shumaker, Houston, Tex., own 51% of the stock. Utex officers are Dan O'Laurie, president,



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Progressive, eyes-ahead engineering is one of the big reasons why so many mine and quarry operators pick Cummins Diesels for dependability.

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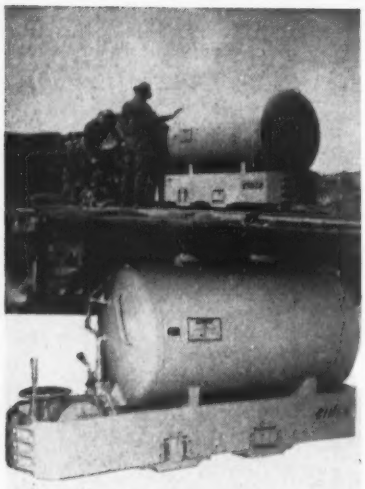

Eimco 2 Speed Air Locomotive

The Eimco 2 speed air locomotive is the answer to economical car handling. It has a definite application in the small mine and prospect drift. It is also being used efficiently in large mines for gathering, switching and in isolated exploration work. Contractors with short runs (up to 2,000') are using their Eimco locomotives with good success.

The principal advantage of Eimco Locomotives is its two speed constant mesh transmission allowing the operator to start the load in low and shift immediately to high. This feature, exclusive on Eimcos, gives you greater distance per cubic foot of air consumed.

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THE EIMCO CORPORATION

BRANCH SALES AND SERVICE OFFICES:

News Briefs *(Continued)*

and W. T. Hudson, vice president, both of Casper, Wyo., and R. M. Barrett, of Dove Creek, Colo., secretary-treasurer.

★ ★ ★

Atomic power stations with a capacity of from 100,000 to 400,000 kw. may be built in South Australia in the near future, says Provincial Mines Director Dickinson. He says South Australia is probably the only place in the entire British Commonwealth where industrial use of atomic power could at present be made on a commercial basis if solution were found to technical problems precluding immediate operation. The province presently plans to build a reactor, probably a small one, by 1956 and operate it two years later.

★ ★ ★

New developments in zirconium extraction growing out of intensive research on the part of the Bureau of Mines and private enterprise will be described at the Western Metal Congress scheduled March 23-27 at the Statler Hotel, Los Angeles.

★ ★ ★

Orinoco Mining Co. has been rushing preparations at Cerro Bolivar, U. S. Steel's year-end statement says, in order to begin shipment of Venezuelan iron ore early this year. The dock at Puerto Ordaz was completed and has been in operation for some time.

★ ★ ★

In what is believed to have been the worst disaster in Philippines mining history, the Baluarte mine, one of the United Paracale group, was flooded by an inrush of water from what may have been an open fissure that extended upwards to the Paracale river. Fifty-five men lost their lives, and the mine appears to be lost. The mine was among the largest prewar gold producers in the Philippines.

Mine officials are uncertain of the cause. It appears that a drift from the 200 ft. level of the No. 2 shaft extended under the river, but the ground gave no indication of danger when the shift went on. Workers had no chance to escape when an airblast signaled that the mine was endangered. The pumps failed when water reached the shaft and cut off the power. A few men were able to climb up the ladders ahead of the water.

The mine manager said there is no chance to salvage the mine or recover the bodies. Operations are continuing at the two other United Paracale properties, Longos and MacDonald.

★ ★ ★

Little hope was held, as this issue went to press, for an early settlement of the strike that has shut down the Port Pirie (Australia) lead smelter and refinery since last Dec. 22. The strike is shrinking the flow of refined lead, largely to Britain. The smelter has been producing 15,400 tons a month.

★ ★ ★

Nearly 2 mi. offshore of Lake Michigan's natural shore line — on a peninsula built through the years by the dumping of Inland Steel Co.'s slag — Inland poured its 80-millionth ton of steel ingots on Jan. 15. It came out of one of four open-hearth furnaces that went into operation late last year at the company's Indiana Harbor works—new equipment that lifted Inland's annual steel-making capacity 750,000 tons to 4.5-million tons. Now the plant can produce in five days the 60,000 ingot tons that was its annual capacity when the first ton was poured in 1902.

Progress With Heat-Hardening of Taconite Pellets on Traveling Grate

Pilot plant work for heat-hardening pellets of magnetic taconite concentrates now being done by Allis-Chalmers Mfg. Co. in cooperation with the Arthur G. McKee Co., Cleveland, was described in an interim report by G. V. Woody, manager of the company's processing machinery department, before the Minnesota Section of the A. I. M. E. in Duluth on Jan. 12. The report stated that the pilot plant has been completed and two test runs, one for two hours and one for seven hours, have been made. The taconite concentrates used came from Reserve Mining Co.'s preliminary plant at Babbitt. See E&MJ, Nov., 1952, pp. 72-79.

During the seven-hour run, a three-hour test was conducted and the following data were obtained:

Feed from the table feeder to the pellet-forming drum was 3,120 lb. per hour at 5% moisture. Pellets smaller than ⅜ in. and larger than ¾ in. were screened out before leaving the drum. The pellets were then sent through a drying drum where some of the moisture picked up in pelletizing was removed.

The "burning" or heat-hardening of the pellets is continuous, involving use of a traveling grate. The theoretical output of the pilot-plant grate traveling at 2 in. per minute is 1.22 tph. (short) and the actual output 1.15 tph. This capacity is probably less than half that to be attained when the grate is run at full speed. Bulk weight of pellets entering on the grate equaled 135 lb. per cu. ft., while that of the pellets discharged equaled 116 lb. per cu. ft.

Total heat consumed in the process

was approximately 650,000 Btu per short ton.

Final product was subjected to a tumbling test in a standard coke-testing drum. Fifty pounds was put into a tumbling mill and revolved for about four minutes at 24 rpm. The subsequent screen analysis yielded 12% minus-10-mesh fines.

Research and test work has barely been started. The full story will not be known for several months. Maximum grate output must still be determined. Work is being done to improve pre-drying of the pellets on the grate, a factor which when achieved, it is hoped, will increase the output further.

The plant will be able to operate under all weather conditions, according to Mr. Woody, when facilities for continuously introducing concentrate into the plant and continuously taking them away are completed. Production of pellets per square foot of grate area can be increased to a point where the capacity of a commercial unit of 1500 to 2000 tons per day can be expected. Also, Btu consumption per ton of pellets should be much less when experimental work is complete and a commercial plant installed.

Preliminary work on hematite (non-magnetic taconite) concentrates indicates that heat-hardening to a point comparable with magnetic concentrates is possible but not with the pilot plant as now designed.

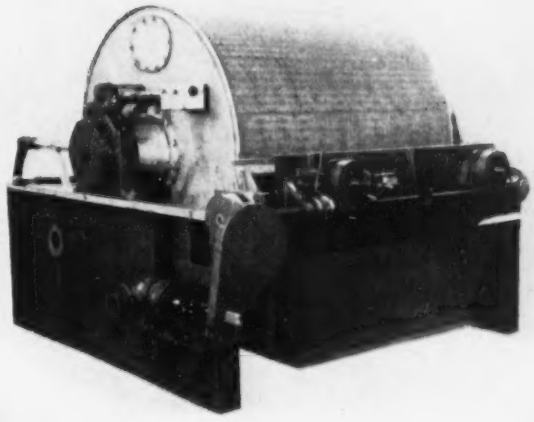
$148-Million Raised For Reserve Taconite

RESERVE MINING CO.'S projected $160-million taconite plant was financed last month by sale of $148-million worth of 4¼% first mortgage bonds to a group of life insurance companies. The issue was underwritten by Smith, Barney & Co. and Glore, Forgan & Co. Republic Steel Corp. and Armco Steel Corp., co-owners of Reserve Mining, will put up the balance of the capital.

Initial operation is scheduled in 1955 with plant capacity for about 2½-million tons a year of concentrate containing upwards of 60% iron, this capacity to be expanded until a rate of 3¾-million tons is attained, as scheduled, in June, 1957. Capacity of the preliminary section Reserve is now operating at Babbitt, Minn., is 300,000 tons a year. (The company's long-range plan—completion date and cost of which cannot now be determined—is to attain 10-million-ton-a-year capacity.)

Current project as planned includes an open-pit mine, primary and secondary crushing plants, and a grinding, concentration, and agglomeration plant, all at Babbitt, and a 47-mi. rail line to Lake Superior's Beaver Bay, site of the projected harbor, docks, loading equipment, and 55,000-kw. power plant.

Filters for Metallurgical Industries



Eimco's experience in solving difficult and unusual filtration problems can be helpful to you.

Many complex ores require the cooperation of producer and manufacturer to provide the proper equipment for maximum results. Eimco offers its laboratory services to aid in determining the filterability of any slurry.

Old processes as well as new can benefit by the numerous new innovations being developed by Eimco specialists in vacuum filtration.

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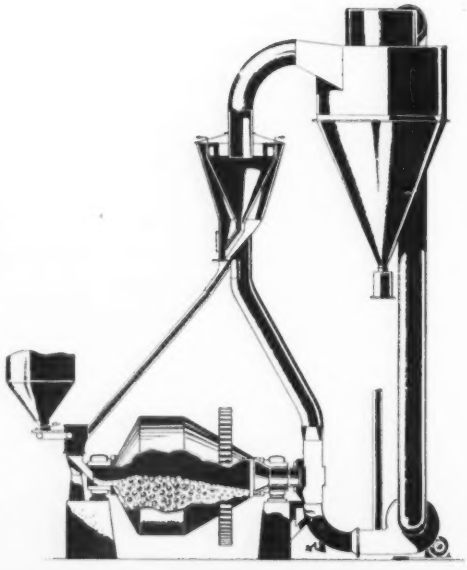
IS YOUR PROBLEM

DRY CLASSIFYING



One of the preferred dry-grinding arrangements is the closed grinding circuit illustrated here: The Conical Mill has a gravity overflow discharge. The product is pulled into the vertical air stream at the mill discharge due to a drop in air pressure at this point. The Hardinge Air Classifier separates a product as fine as 99½% passing 325 mesh or as coarse as 35 mesh if desired, returning the oversize to the mill. The entire system is closed, except for the feed end of the mill. A negative pressure is maintained in the air conveying system which makes the entire operation dust free.

HARDINGE

Venture in Brazil Slated To Yield 5.5-Million Tons Of Manganese Ore

AUTHORIZATION of an Export-Import Bank loan of up to $67.5-million, and signing of a DMPA purchase contract involving production of 5.5-million tons of manganese ore from deposits in Brazil have been announced simultaneously in Rio de Janeiro and Washington.

The project is to be undertaken by Industria e Comercio de Minerios, S.A., of Rio de Janeiro, a Brazilian corporation in which Bethlehem Steel holds partial stock interest. About $4-million has already been invested in exploration and other preparatory work at the minesite. The Brazilian deposits, described as high-grade metallurgical ore, are located in the federal territory of Amapa, about 150 mi northwest of Macapa.

The deposits have been tested by core drilling and are estimated to contain upwards of 10-million tons of ore averaging 45 to 47% manganese. Mining will be by open pit, and the ore, after being crushed and screened, will be shipped to docks on the Amazon River over a railroad yet to be built. The railroad will be of standard design and 134 mi. long, half in dense tropical jungle and the other half traversing open country.

Officials said that at least 70% of the 5½-million tons of ore, production of which will cover a period of several years, is to be offered to the United States.

It is expected that large-scale production will get under way by 1956. During that and the following year, the company is to deliver to the U.S. a total of 400,000 tons at a price 10% below market at time of delivery. The U.S. Government has an option on 30% of total output.

Floor Price of 65¢

DMPA has guaranteed the company a floor price of 65¢ per long-ton unit, based on 45-47% ore, c.i.f. Eastern Seaboard ports, for any part of the production up to 5½-million tons that the company offers to the U.S.

The principal of the credit is to be repaid by Dec. 31, 1965, and it will bear interest at the rate of 4½% per annum. The DMPA purchase contract runs to June 30, 1962, but would terminate upon repayment of the loan at an earlier date.

To produce ore on the scale contemplated, extensive installations will be necessary, including housing and community facilities for employees, a dock and loading facilities at Santana, near Macapa on the Amazon, the railroad, plants, and equipment. Facilities for the rapid loading of large vessels will be installed, along with docks for the handling of other freight.

NW Miners Protest Land Law Proposals

FILING OF FRAUDULENT CLAIMS should be deterred by more rigid enforcement of laws on the books rather than new legislation, the Northwest Mining Association resolved at its 58th annual convention in Spokane, Wash. More than 500 attended.

Other resolutions called for tariffs on lead and zinc that would rise and fall in inverse ratio to the price levels, revision of Securities and Exchange Commission regulations to make mining investment more attractive to venture capital, reduced federal spending, exclusion of power requirements of underground mines for pumping, ventilation, and hoisting from cut-backs in power allocations, and government encouragement for resumption of antimony mining.

On labor, the miners called for prohibitions on all forms of compulsory unionism, labor monopolies, industry-wide bargaining, union interference in the domain of management and the rights of workers, mass picketing, violence, and intimidation. They asked for a purge of Communist influence within unions, a requirement that the President exercise his extraordinary powers to meet national emergencies arising from strikes and lock-outs, and that NLRB decisions be based only upon preponderance of evidence.

On taxes, they asked for unlimited deductibility of exploration expenses, retroactive repeal of the excess profits tax, tax exemption for new mines for three years after commencement of profitable operation, more liberal allowances for depreciation, reduced taxes on capital gains, and a 50% ceiling on overall income taxes of both individuals and corporations. They further resolved that taxes on dividends be reduced to compensate for taxes paid by the corporation and depletion and that compensation be allowed in taxes in profitable years for losses suffered in other years.

The gold standard should be reestablished, they resolved, and restrictions on gold exchange be removed. They voted support for the government's program for acquisition of silver, but asked removal of the seigniorage on newly mined domestic silver.

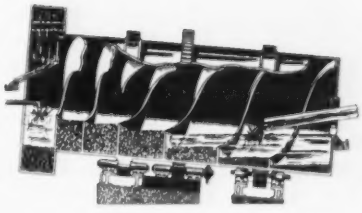
On Paley Report recommendations, the convention protested the proposal for international buffer stocks, commended those advocating tax reform, accelerated topographic and geological mapping, and stimuli to exploration and smaller mining enterprises.

The miners' position on national stockpiling was that it should be paced in such a way as to provide a prop for mining interests in times of unfavorable supply-demand ratio and that stockpiled material should be released only when "there is a declared emergency such that national security clearly requires the release of a particular metal or mineral."

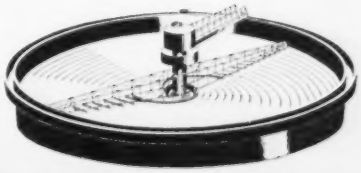
IS YOUR PROBLEM

WET CLASSIFYING

Counter-Current Classifier built by Hardinge produces closer sizing and cleaner oversize because of its unique construction. It consists of a slowly rotating drum, on the inner surface of which is attached a screw flight. The coarse material is separated from the fines through the action of gravity. The settled granular particles are rolled forward by the screw flight and washed with a counterflow of wash water. The fines and wash water overflow through an opening at the discharge end. The oversize is elevated by buckets in the enlarged portion and discharged. Will operate in closed circuit with a grinding mill without the use of conveyors or pumps. Bulletin 39-B-1.



Hydro-Classifier built by Hardinge is a large-volume classifier for fine separating problems. In combination with the Counter-Current Classifier, it provides positive control of sizing and moisture. Bulletin 39-B-1.



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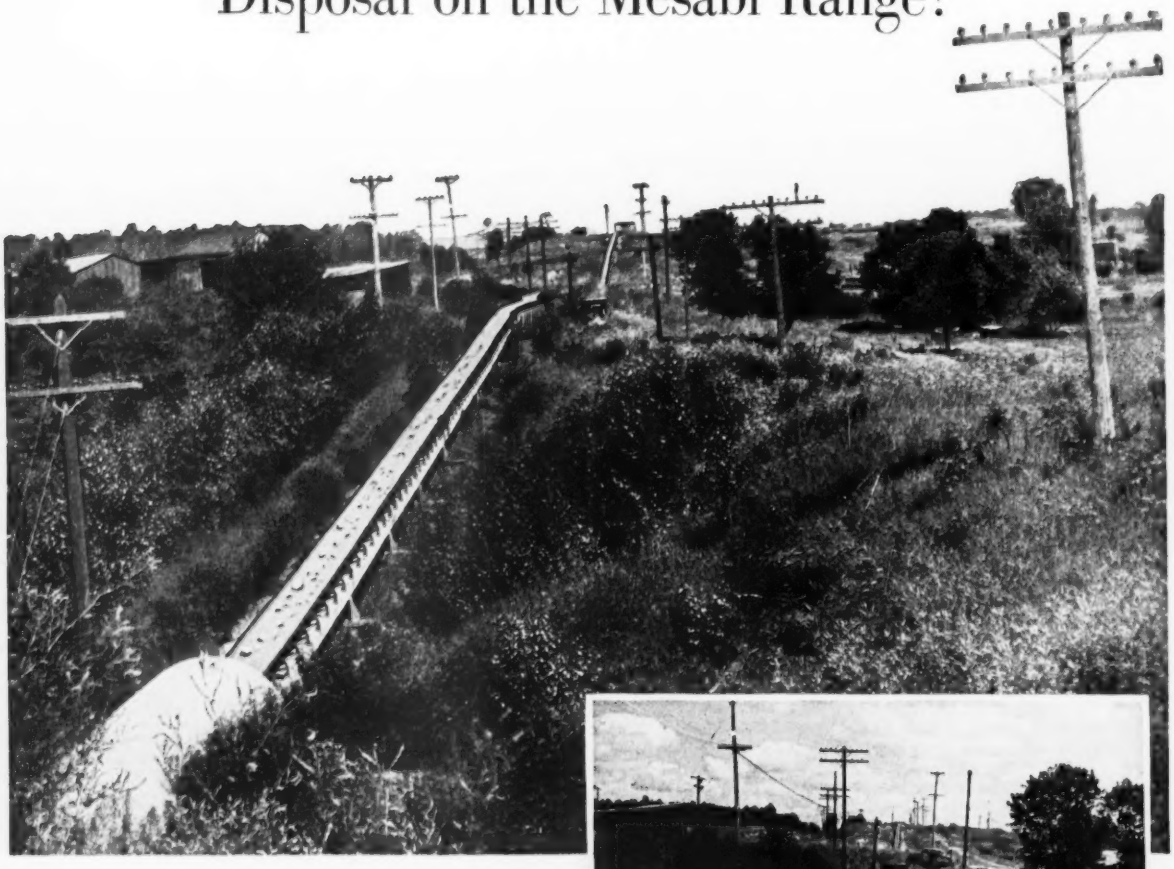
What's U. S. Rubber doing for Overburden Disposal on the Mesabi Range?



This U. S. Giant Style XN Conveyor Belt forms the most important link in an overburden disposal system on the Mesabi Range. It hauls 900 tons per hour of overburden at 500 feet per minute through a distance of 2000 feet, over and under railroads, over roads and rough terrain. The excellent belt troughability is created by using Nylon in the transverse direction of the belt. This results in ease of training, true running and elimination of spillage.

U.S. Rubber Engineers are specialists in designing and manufacturing belts for any material handling problem. Make it a point to consult them . . . write to the address below.

Large photo shows versatility of U.S. Giant Style XN Conveyor Belt carrying "overburden" over and under Mesabi contours. Small photo shows close-up of this 2000 ft. center belt. Notice troughability and perfect belt alignment.

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Titanium Index Saves Investigation Time

SCIENTISTS of the USGS have established a significant negative correlation between quantities of titanium and iron found in certain ores on Minnesota's Cuyuna Range and from it have found a cheap, time-saving method of assaying core samples for iron content, using titanium as an index. Analysis of a sample requires only 10 minutes and about 10¢ worth of reagents.

A small quantity of the sample is ground to a powder, weighed in a measuring spoon, fused with flux in a test tube, and dissolved in water containing conditioning agents. The sodium salt of an organic acid (disodium 1,2-dihydroxybenzine 3,5-disulphonate, sold by LaMotte Chemical Products Co., of Baltimore, under the trade name Tiron) is then added. Intensity of the resulting yellow color is a measure of the percentage of titanium content. Sodium hydrosulphide is added to counteract interference by a deep purple color resulting from the iron's going into combination.

Details may be obtained by writing to W. W. Brannock, USGS, North Building, Agricultural Research Center, Beltsville, Md.

Beltroad Proposed For Cleveland Harbor

INSTALLATION of a 4½-mi. rubber conveyor beltroad to carry iron ore and limestone from Cleveland's harbor to industrial plants was proposed at a recent meeting of Cleveland Port and Harbor Commission. The proposal is the conclusion of a report prepared by engineers of B. F. Goodrich Co.

The belt would be laid parallel to the Cuyahoga River and provide a transportation route that would not be closed—as is the river—in freezing weather. It's estimated it could be installed in a year for $6-million.

Bilharz Muncie Sold

BILHARZ MINING CO., INC. (P. O. Box 191, Baxter Springs, Kan.) has sold the Bilharz Muncie group to Eagle-Picher Co. The property covers 320 acres in the northwestern part of the Picher field. "The original Muncie property," writes O. W. Bilharz, president of the Kansas firm, "was purchased by us in 1946 from Federal Mining and Smelting Co. Subsequently, the adjoining Tar Creek and Southern properties were leased and mining operations conducted on all the properties through an underground highway system joining the main hoist shafts on the Muncie proper. Our operation was fully mechanized, with diesel-powered jumbos, hitowers, Hough Payloaders, and Dart 10-ton trucks."

SuperDuty Concentrating Tables Winning World Markets

An increasing number of inquiries and orders from other continents is eloquent testimony of the efficiency and reputation of the SuperDuty Diagonal Deck Concentrating Table.

It takes only a glance for an engineer to appreciate the diagonal deck principle that has won such favor. Permitting the placement of 75% more riffles in the natural path of concentration, the material bed is fanned out for more efficient separations and more accurate cutting of products. This means higher grade concentrates and leaner tailings and substantial reduction of middlings. Result . . . more tons of new feed handled per day.

Send for Bulletin 118B.

Concenco Type "CPC" Classifier

This All-Steel Constriction Plate Classifier is available in 1 to 10 or more cells. Each cell has a pressure chamber at the bottom, a sorting column just above, and a launder section at top. Advantages offered are: (1) Sharp separations, (2) accurate classification, (3) as many spigot products as there are cells, (4) continuous discharge, (5) no moving parts, (6) low maintenance cost.

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ARIZONA

★**Yuma Metals, Inc.**, has just signed a $75,000 DMEA contract to diamond-drill 6,000 ft. of holes in the Red Cloud mine in Yuma county in an effort to prove a sulphide zone believed—on the basis of leaching in the oxidized upper strata—to exist below the watered lower workings. The operation will be conducted from the 500-ft. level. If sulphide ore satisfying the hopes of the prospectors is found, it will give good values in silver, lead, and zinc.

Luke Walker, secretary and treasurer, in making announcement of the DMEA contract, said the company will at the same time begin at Red Cloud a 15-month program including 1,650 ft. of drifting, 8,000 ft. of surface drilling, and installation of a 100-ton pilot flotation mill.

He reported that, though dormant since the 'Eighties, Red Cloud's workings are in such good condition that no re-timbering will be required. He said the mine's ore assays 6.07% lead, 10.15 oz. of silver, 1.79% MoO_3, 9.4% zinc, and some vanadinite and that the mine's water supply—estimated at from 75 to 100 gpm. and said to be unique in the silver district—would be sufficient for a 125-ton mill.

★A mica mill at Aguila, in western Maricopa County, has been reopened by Phillip Hoyt, who plans to purchase ore from southwestern producers. As western agent for **Beryllium Corp.**, he will pay $500 a ton for 12%-BeO-content ore. The address is **Mica Mills,** Box 83, Aguila.

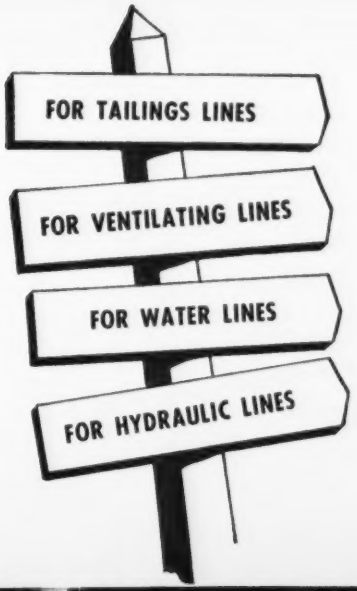
★Acceptance of ore shipments was scheduled to begin before press time at **the manganese ore-buying station** at Wenden, west of Wickenburg. The sampling plant will have a capacity of 400 tons each eight-hour shift, reported V. W. Winter, in charge of construction.

★**Exploration contracts** in force in Arizona by December totaled $487,865 in government participation with a contract value of $803,663.

CALIFORNIA

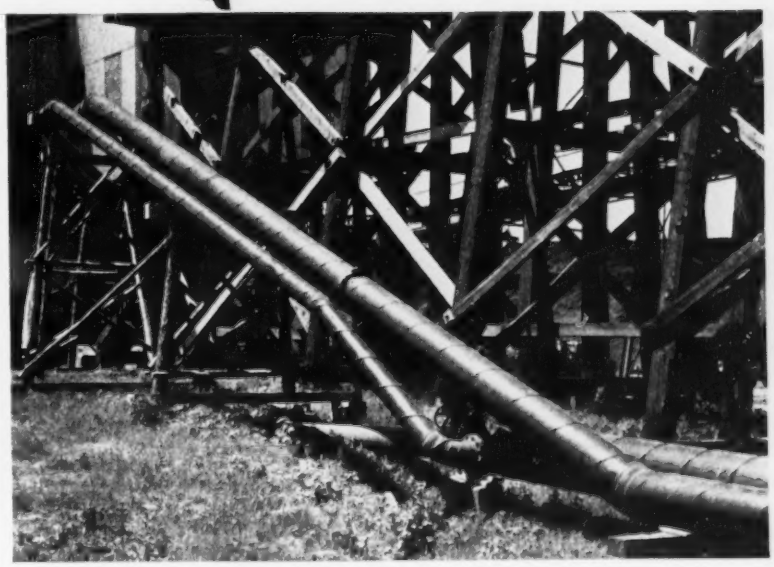
★Considerable high-grade manganese ore has been shipped to the government purchasing depot at Deming, N. M., from **Lakeview Manganese Mines** operating the Lakeview and other properties in the Crescent Mills area near Quincy, Plumas County. About 10,000 tons of ore averaging about 45% manganese was mined from a 1-acre area in recent months; ore now produced averages 35% and is concentrated for shipment.

Lakeview is also developing an adjacent property, and work is proceeding at a number of manganese



You're on the right track with

NAYLOR PIPE



You can't go wrong with Naylor pipe for lines in mining service. Naylor gives you a light-weight pipe that's easier to handle and install—especially with Naylor's Wedge-Lock couplings. It differs from other light-weight pipe because it is built with a lockseam spiralwelded structure that adds extra strength and safety for heavy-duty service. That's why it fills so many applications in mining operations. It will pay you to write for Bulletin No. 507 on line pipe and Bulletins No. 513 and No. 514 on Naylor Wedge-Lock couplings.

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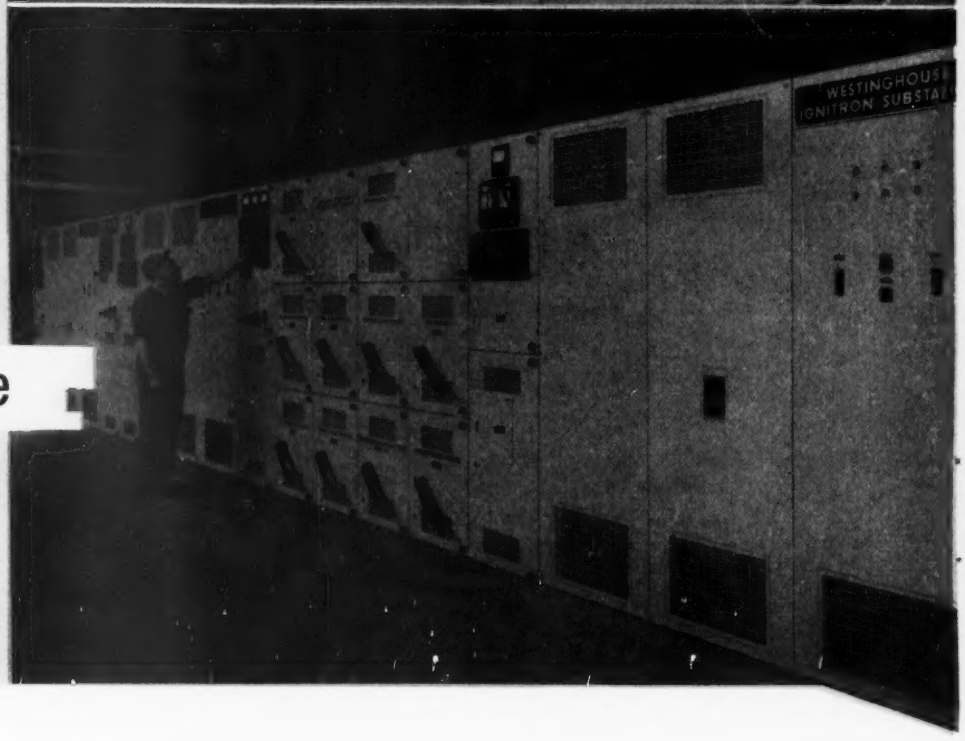
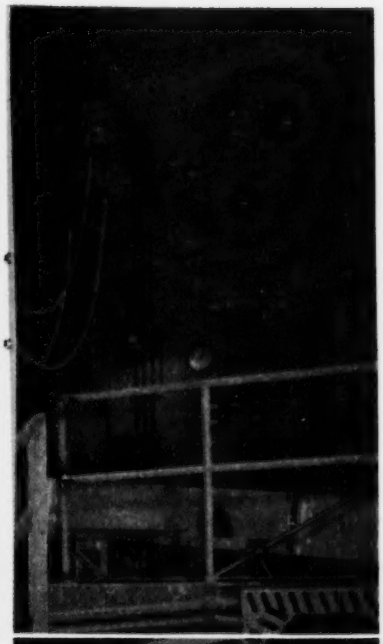
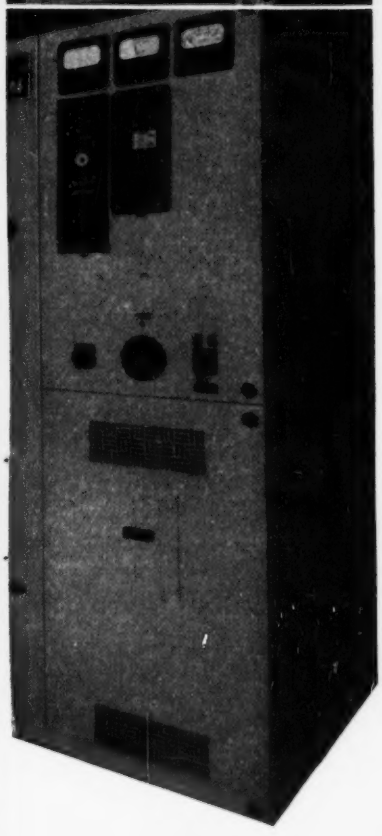


Two Modern Production Techniques at Kennecott's new refinery





Here are two interesting production ideas in operation at the new Kennecott Copper refinery at Garfield, Utah—(1) the large Lectromelt arc furnaces used for melting and (2) the method of supplying d-c power for cranes and auxiliaries.

Furnace output 2 or 3 times that of reverberatory types

Three large Westinghouse-equipped Lectromelt furnaces melt the electrolytic copper. Each furnace is a continuous melting unit and produces at a high rate. Accurate control and absence of combustion produce a high-quality product. There's no possibility of fuel contamination and no need for poling.

Westinghouse makes all furnace equipment

All electrical equipment for use with the furnaces was supplied by Westinghouse. Furnace transformers have the Westinghouse shell-form construction, inherently much stronger and better-cooled than core-type design. The Westinghouse air circuit-breakers operate about 15,000 times between inspections—as against 2,000 times for conventional furnace breakers. Furnace control is Westinghouse ROTOTROL® which responds fast and accurately maintains proper melting conditions.

D-C power supplied at low cost

Another major item of equipment at Kennecott is the Westinghouse Ignitron substations which turn out d-c power for cranes. These rectifiers have no major moving parts and need very little maintenance or attention. In two years of service there have been no tube failures. The units average about 6% higher efficiency than corresponding motor-generator sets and they cost considerably less to buy and install.

Call Westinghouse for ALL mining apparatus

The results at Kennecott are typical of the performance of *all* Westinghouse equipment for mining. When your next job comes up, get in touch early with your nearby Westinghouse office. Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa.

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deposits in Crescent Mills, Canyon Dam, and other Plumas County areas.

★Near Alleghany, **mining of rich gold ore** continues at the Oriental mine, operated by Mrs. Florence V. V. Dickey. High-grade ore shipped recently to the Selby smelter was valued at about $250,000. The 16-ft.-wide orebody was discovered recently in a virgin area of the old producer. Currently, Superintendent Mike DeGrio plans to operate the mill.

★Stagnation of precious-metal ore-mining and diminishing returns from placer deposits sharply decreased California's gold output for 1952, as compared with 1951. At the same time, lead and zinc suffered from low prices and ore depletion at heretofore steadily producing mines. Silver and copper, largely by-product metals, reflected the trend. Value of the five metals in 1952 was $16,880,579, compared to $21,700,575 in 1951.

Gold production was valued at $8,874,355 for 1952, compared to $11,980,620 for the previous year; lead production for 1952, $3,516,800, compared to $4,832,582; zinc fell slightly to $3,088,800 from $3,495,128. Production of silver was $1,002,104 in 1952, compared to $1,036,481; copper production, $394,520, compared to $445,764 in 1951.

COLORADO

★The trend in **gold mining is improving.** There has been considerable rustling for jobs at Cripple Creek lately. Superintendents believe cold weather has slowed construction work and thus sent workers to the mines. Many have come here from Idaho.

★**Ventura Leasing Co.** is operating its 50-ton lead-zinc flotation mill at the Gold Prince mine at Silverton. The mill, at the lower tunnel of the Gold Prince, was built with the aid of a $23,000 U. S. loan. John Cook, Leslie Larson, and William Gianetto are partners in the company.

★**Boulder County Mining Association** decided at a recent meeting to petition the government to improve the tungsten situation. Harrison Cobb, vice president of Colorado Mining Association, heads a committee advocating a tungsten program more compatible with conditions in Boulder County.

★The new mill of **Golden Cycle Corp.,** erected at Cripple Creek for $1.5-million, has produced over $2-million in gold ingots. Max Bowen, of Cripple Creek, is manager.

★At Montezuma, a new strike has been made at **the Bullion mine.** A. R. Rhine (2550 Yarrow St., Denver) has been exploring the Yellow Jacket vein and contacted the Aorta vein, rich in lead and silver ore. The aerial tram has been completed, and work is progressing on construction of winter quarters.

★The Gunnison metal mining area was

90% to 99% recovery of smelter dust?

Research Corp. Engineer — Yes sir. Over 1200 installations prove the high collection efficiency of Research Corporation Cottrells.

In one installation, 6500 pounds of smelter dust containing 14% cadmium and 30% lead are recovered per day.

Smelter Executive — What about draft loss?

Research Corp. Engineer — It's extremely low—only a few tenths of an inch of water.

Smelter Executive — Do you actually guarantee performance?

Research Corp. Engineer — Absolutely. And you can depend on Research Corporation because of our 38 years of experience in the field of electrical precipitation. That's your yardstick of performance.

RC 139

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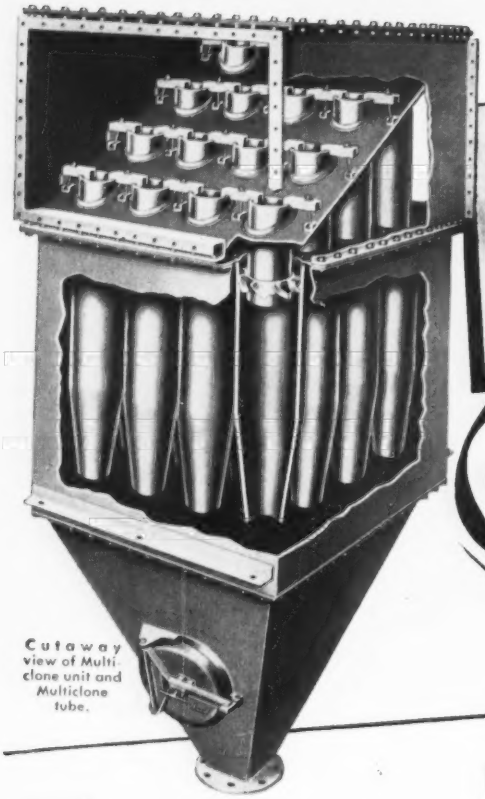


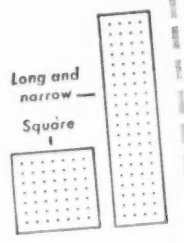
Cutaway view of Multiclone unit and Multiclone tube.

There are 4 things to look for In Dust Recovery Equipment

Only MULTICLONE has them all!

ONE

MAXIMUM ADAPTABILITY: Equipment that is adaptable to various installation requirements saves installation costs, saves space, provides greater operating efficiencies. Multiclone's adaptability is unequalled. It can be installed with side inlet side outlet, or side inlet top outlet . . . its shape can be varied (long and narrow, short and wide, or square) to fit different spaces . . . and its single inlet single outlet duct design permits greater flexibility and simpler installation.



TWO

SPACE-SAVING COMPACTNESS: Plant space costs money—so check space requirements carefully. Note in the accompanying chart how the Multiclone requires less cubic space than any other unit of comparable capacity and performance. Translate these savings into today's high costs for plant space and you readily see the vital importance of this one Multiclone advantage alone!

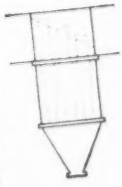
Make	Relative Space Requirements In Sq. Ft.	In Cu. Ft.
Multiclone	1.0	1.0
Collector A	2.1	1.8
Collector B	5.9	3.2
Collector C	6.8	3.9

THREE

HIGH RECOVERY: Multiclone's multiple small diameter tubes—made possible by its exclusive vane design—whirl the dirty gases with greater centrifugal force, thus throwing out not only the large, medium and small particles but also a high percentage of the extremely small particles of ten microns and less. This results in a more complete recovery of all suspended materials from the gas stream.

FOUR

MINIMUM MAINTENANCE: In the Multiclone there are no high speed moving parts to require repair or replacement . . . no pads or filters to clean or renew . . . nothing to choke the gas flow or increase draft losses as suspended materials are recovered. Draft losses in the Multiclone remain uniformly low at all times. Moreover, the recovered material from an entire bank of tubes is collected in a single hopper—much easier to service and maintain than the multiple hoppers of conventional cyclone units!



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PRECIPITATION CO. OF CANADA, LTD., DOMINION SQ. BLDG., MONTREAL

The above features are by no means the complete story on Multiclone savings. Engineered by the same organization that pioneered the first commercial application of the Cottrell Electrical Precipitator, the Multiclone embodies the results of more than 45 years' experience in all phases of recovering suspended materials from gases. Before you install any recovery equipment, get all the facts on Multiclone advantages!

Send for Multiclone Booklet.

stimulated by a rumor that Idarado Corp., operators of extensive mining interests in the Ouray area and a subsidiary of **Newmont Exploration Co.**, was preparing to take over operation of **Colorado Standard Lead and Zinc Co.**, above Lake City.

GEORGIA

★Special master John Gilbert has ruled that the patent of **Georgia Kaolin Co.** for treatment of Georgia clay is valid but that **Thiele Kaolin Co.**, of Sandersville, was innocent of any infringement. Georgia Kaolin brought suit in 1949, claiming infringement and seeking damages. Federal Judge Frank M. Scarlett has given both firms an opportunity to file briefs in the infringement suit.

The patent covers a process for selective disposal of large particles in preparing the clay for use in manufacture of high-grade paper for magazines and books.

IDAHO

★**Lucky Friday Silver-Lead Mines Co.**, hard-hit by the 10% power cut, has been granted sufficient relief under the "undue hardship" clause of the Defense Electric Power Administration's cutback order to continue full production and employment at its property in the Hunter district of the Coeur d'Alene mining area.

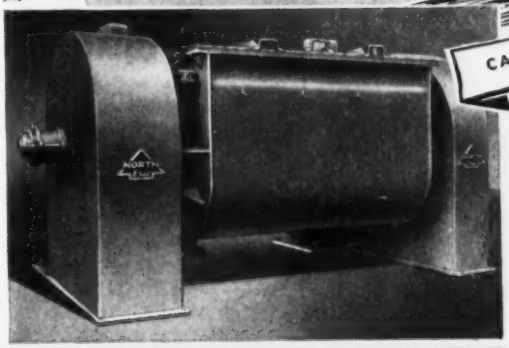
Practically all development work, including sinking of an offset winze from the 2000 to the 2200-ft. level, has been suspended until the power situation improves, but ore output is being maintained at the rate of about 100 tons a day, reported President John Sekulic, of Mullan.

★Deep-level exploration of the east silver belt of the Coeur d'Alene mining district is expected to be under way within the next few months. Deepening of the three-compartment main shaft at the **Atlas Mining Co.** property near Mullan, from the 800 to the 2400-ft. level, was started last July 1, had progressed well beyond the half-way point by the first of the year. In recent months, the rate of progress has exceeded 5½ ft. per day, with three crews of four men each working around the clock.

Purpose of the Atlas project is to explore at depth several strong veins in a bleached and altered quartzite formation which has been proved a favorable host rock for ore deposition in the west end of the silver belt, where the Sunshine, Silver Summit, and other productive mines are located. Exploration is being financed by **Hecla Mining Co.**, **Newmont Mining Corp.**, and **New Jersey Zinc Co.** under an agreement with Atlas Mining that gives each firm a 25% interest. A number of companies owning adjoining properties have elected to partici-

NORTH ERIE • NORTH ERIE • NORTH ERIE • NORTH ERIE • NORTH ERIE

* ALUMINUM *also* is our business



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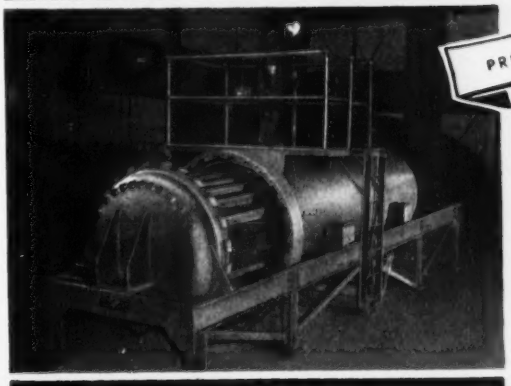
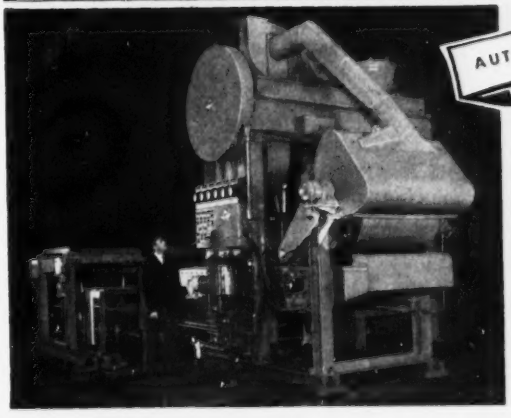
ELECTRODE MATERIALS PROCESSING
All sizes and types to 2000 gallons capacity



PRESSURE FILTER UNITS

SODIUM ALUMINATE CLARIFICATION
300 sq. ft. to 3000 sq. ft. filter area



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AUTOMATIC FABRICATION and WORK HANDLING EQUIPMENT

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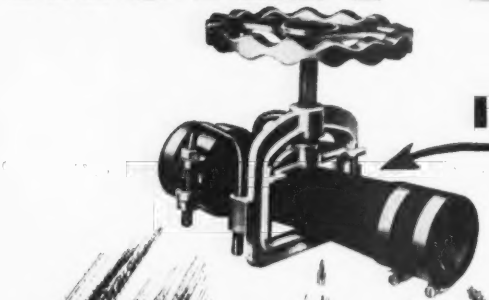

IF IT PLUGS

Basically, the Flex-Valve is just a piece of flexible tubing and a clamp to squeeze it shut. It can no more clog than a length of pipe. So, if you can clog one of them in normal service, just tell us, for the "incredible-but-true" record, how in the world you did it, and we'll send your money back.

Flex-Valves have solved thousands of valving headaches —in as many plants as there have been installations made. They can handle anything that flows, including aerated or fluidized solids. They close bubble-tight over 1/8" solids. Open, the flow is straight-in-line with the service piping, and completely unobstructed. There are no moving parts in contact with the lading fluid. Available in both natural and synthetic materials for every corrosive or abrasive service.

Complete details on this unique principle of control valving in slip-on, flanged, and air-motor operated types are available on request. Ask for **Bulletin 500***—without obligation, of course.*

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1192

Idaho *(Continued)*

pate in the deep-level exploration, and the Atlas participation area now extends for more than 10 mi. from east to west and several miles from north to south.

Hecla is the operating company, and W. H. Love, Hecla engineer, is in charge.

★Experimental work in the Coeur d'Alene mining district by USGS during 1950 and 1951 gives high promise for **two relatively new prospecting techniques.** Geochemical methods—analyses of soil for metal content—were tried along the outcrops of 18 known veins. Concentrations of metal were found in the soil along the veins, even though in one case the top of the ore shoot was known to be 300 ft. below the outcrop. On two properties tested, the Little Pittsburg and the Jack Waite, mineralized zones hitherto unknown were indicated. Encouraging results were also obtained in the limited amount of biochemical prospecting that was done. This method involves analysis of needles and twigs of coniferous trees.

★**Monsanto Chemical Co.'s** big new elemental phospohrus plant in Caribou County has commenced operations. The plant, 2 mi. north of Soda Springs, processes ore from the company's strip mine about 10 mi. north of the plant. The ore is converted to a phosphorus gas and shipped by rail in special tank cars.

★**Sunshine Mining Co.** is revising the flowsheet for its concentrator on Big Creek to improve grade and marketability of products. The company, which mines both silver-bearing tetrahedrite and silver-bearing galena ores, had been making bulk concentrates containing both copper and lead with the silver. Changes now being made in the flotation process will result in production of two concentrates, one a high-grade silver-copper concentrate running as high as 2000 oz. of silver per ton and the other an iron concentrate which will carry most of the lead and about 100 oz. of silver. The old bulk concentrate, when sold to a copper smelter, gave a lower return on lead, and, when sold to a lead smelter, led to some sacrifice in the return on copper. Now the silver-copper concentrate can be shipped to a copper smelter and the residue iron-lead concentrate to a lead smelter.

★**Nine collective bargaining units** have been established by NLRB in the Coeur d'Alene mining district. The Sunshine mine, Lucky Friday mine, and Federal Mining and Smelting Co.'s Morning mine have been set up as separate units for bargaining purposes. Bunker Hill's mine, mill, and smelter and the Sullivan electrolytic zinc plant, all at Kellogg, constitute another unit. Comprising another unit is a group of 16 employers who, in the recent past, have bargained concurrently for convenience. Others

STANDARD ENGINEER'S REPORT

DATA

LUBRICANT Calol SA Grease

UNIT 4 1/2" anti-friction bearings

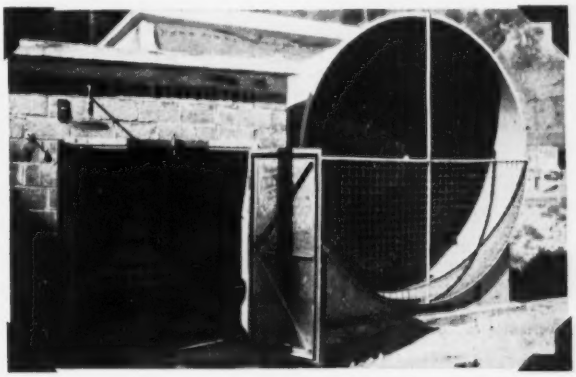
LUBRICATOR Grease gun

CONDITIONS Continuous operation, extreme temperature variations

PERIOD 4 Years

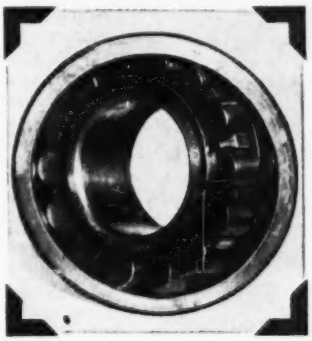
FIRM U.S. Fuel Company, Hiawatha, Utah.

Special grease stays soft at 20° below zero!



PUMPING 250,000 CUBIC FEET OF AIR PER MINUTE at the King Mine, Hiawatha, Utah, this exhaust fan must work continuously in a place where winter temperatures often reach 20° below zero. Even in this extreme cold, Calol SA Grease stays soft—does not channel, allow grease starvation and loss of bearings as was the case when other greases were used. Since using Calol SA Grease, U. S. Fuel Company has had no trouble with fans, a major point since men must be brought out of the mine if fan stops.

CALOL SA GREASE has been used by the King Mine in 4½-inch bearings like this for more than four years. They have not lost or changed any bearings in that entire period! They have also used Calol SA Grease to lubricate mine car wheels—and it stayed in, did a good job, even under heavy loads!



REMARKS: Calol SA Grease has a wide range of uses. It is especially valuable for anti-friction and plain bearings operating in extreme temperatures.

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CALOL

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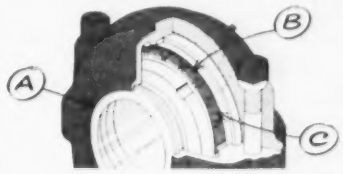
How to reduce wear in all types grease-lubricated machine bearings



Specialized CALOL SA Grease will provide constant lubrication in high ambient and bearing temperatures—proved in mill ambient temperatures of 250°F. and Navy Ball Bearing Machine tests of 10,000 rpm and extreme temperatures.

A. Made from sodium-aluminum base...very high melting point minimizes seepage.

B. Feeds evenly to all bearing surfaces.

C. Remains soft in cold temperatures.

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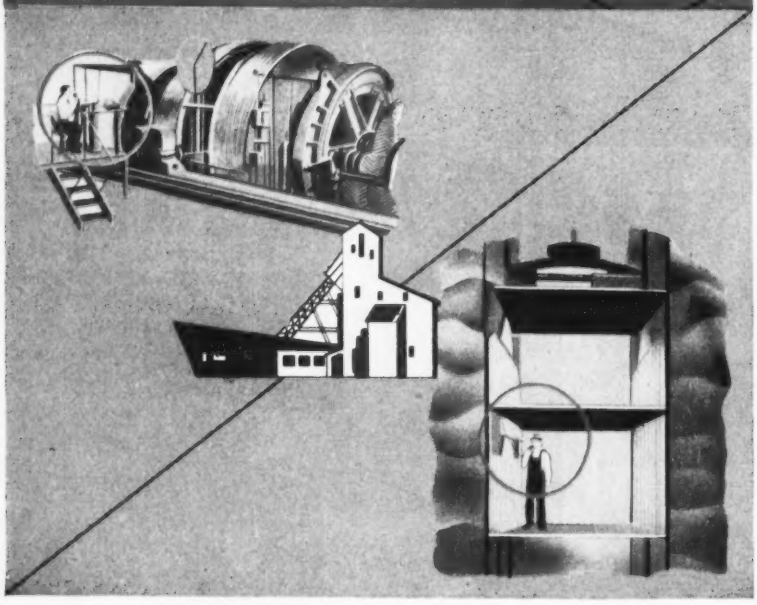

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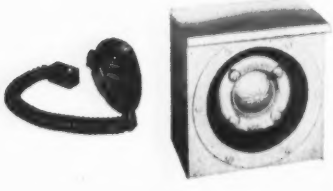
provide low cost
COMMUNICATION
IN DEEP-SHAFT MINES



Safety is improved—production goes up, when Femco equipment is installed. You talk from operator to shaft collar, to moving cage, to surface points and to all levels.

Other Femco Products of Merit include:

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For diesel, trolley or battery locomotives

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Fixed-point industrial communication

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Ask for YOUR Femco Data Kit

Specialists in Electronic Communication and Control

Idaho *(Continued)*

are craft units of bricklayers, carpenters, painters, and machinists employed at the Bunker Hill zinc plant. Unions involved in the struggle for bargaining rights are locals 9 and 18 of the International Union of Mine, Mill, and Smelter Workers, CIO local 1792, and AFL craft unions of bricklayers, carpenters, painters, and machinists.

★**Sunshine Mining Co.** has completed cutting the station for a new level at the 3,850-ft. horizon in its No. 5 winze and is now sinking the winze deeper to establish a 4,000-ft. level 1,300 ft. below sea level, said to be the deepest in the Coeur d'Alene mining district.

★**Polaris Mining Co.** has commenced installing a 600-hp. hoist at its Silver Summit mine in the silver belt of the Coeur d'Alenes. Installation is expected to take more than two months. Coeur d'Alene Hardware and Foundry Co., of Wallace, is building the hoist.

ILLINOIS

★**Alcoa Mining Co.** has begun a fluorspar-drilling program in the Hobbs Creek area of Pope County.

KENTUCKY

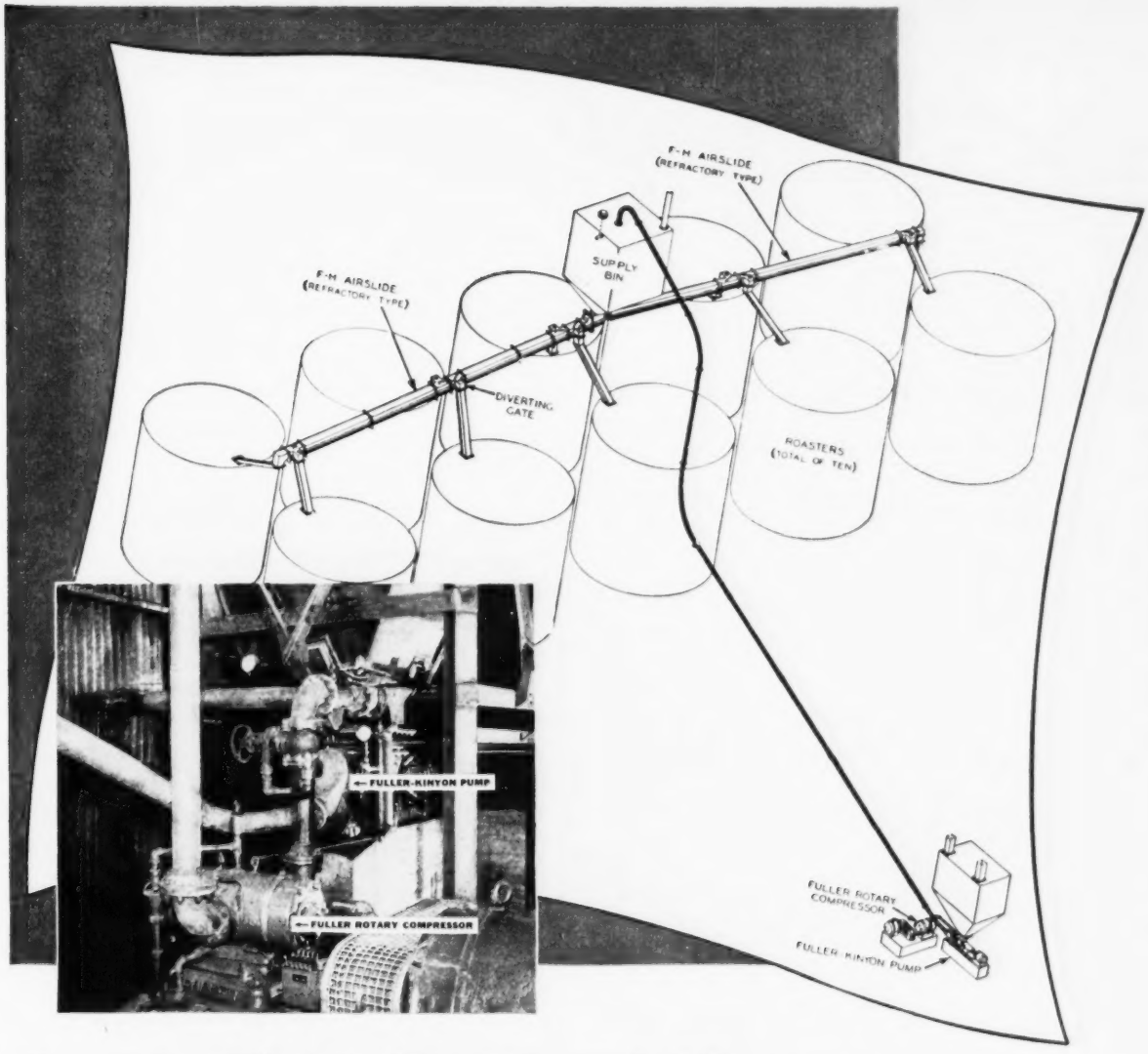
★Preliminary work toward operation of the Eagle-Babb fluorspar mine, in Livingston County, north of Salem, has been started by **Alcoa Mining Co.** Production will be under way within a year, said Walter S. Skeels, works manager, of Rosiclare. The present 300-ft. shaft will be extended 200 ft. The company will truck the ore to its Rosiclare mill.

MAINE

★ Bureau of Mines has outlined **256-million tons of ore containing about 9% manganese** in an area 10 mi. west of Bridgewater, including 121-million tons averaging 11.2%. Metal in the three zones drilled is associated with hematite, and the Bureau investigated possibility of upgrading the ore to produce ferromanganese, using samples sent to its experimental stations at Pittsburgh and College Park, Md. Manganese extraction is complicated by the fact the metal is found in small particles composed largely of silicates.

MICHIGAN

★Reason for locating executive offices of **Calumet & Hecla, Inc.**, in Chicago early this year, said President E. R.



Conveying "Hot Stuff" at Noranda Mines--- with Fuller-Kinyon Pump and F-H Airslides

Problem: To convey hot flue dust from Cottrell precipitator collecting hoppers, and distribute uniformly to ten roasters, without dust or loss.

Solution: After long and careful study by both Noranda and Fuller engineers, it was decided to install a Fuller-Kinyon Conveying System as the most practical and efficient method of conveying from the precipitator to a supply bin. A Fuller-Kinyon Pump, with water-cooled seal, handles this flue dust at temperatures up to 800 deg. fahr., at rate of 25 tons an hour, in a highly satisfactory manner, through a conveying line of approximately 220 feet. From the supply bin, F-H Airslides, of the refractory type, convey and distribute the material to the roasters, with no dust or loss.

A Fuller Rotary Single-stage Compressor furnishes approximately 478 c.f.m. of air at 15-lb. pressure, to the Fuller-Kinyon Pump, through a direct-connected air line.

When your problem is conveying dry, pulverized materials, why not have a Fuller engineer make a study of your requirements. His findings may result in savings you never anticipated or thought possible. Write us today!

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As manufacturers of an extensive line of Filter Cloths our analysis of and recommendations for your filter cloth problems will be unbiased...we have "no ax to grind" regarding any particular cloth.

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Michigan *(Continued)*

Lovell, is to enable the company to pursue more effectively its diversification and growth program. The company has had a five-fold increase in sales in the past decade and today employs over 4,000 in its mines, surface installations, and fabricating plants at Calumet and Detroit, Mich., Decatur, Ala., and Shullsburg, Wis. It produces refined copper, zinc, copper chemicals, foundry products, drill bits, and a variety of ferrous and nonferrous tubing and products made from tubing. The markets are nationwide and, for some products, worldwide, Lovell stated.

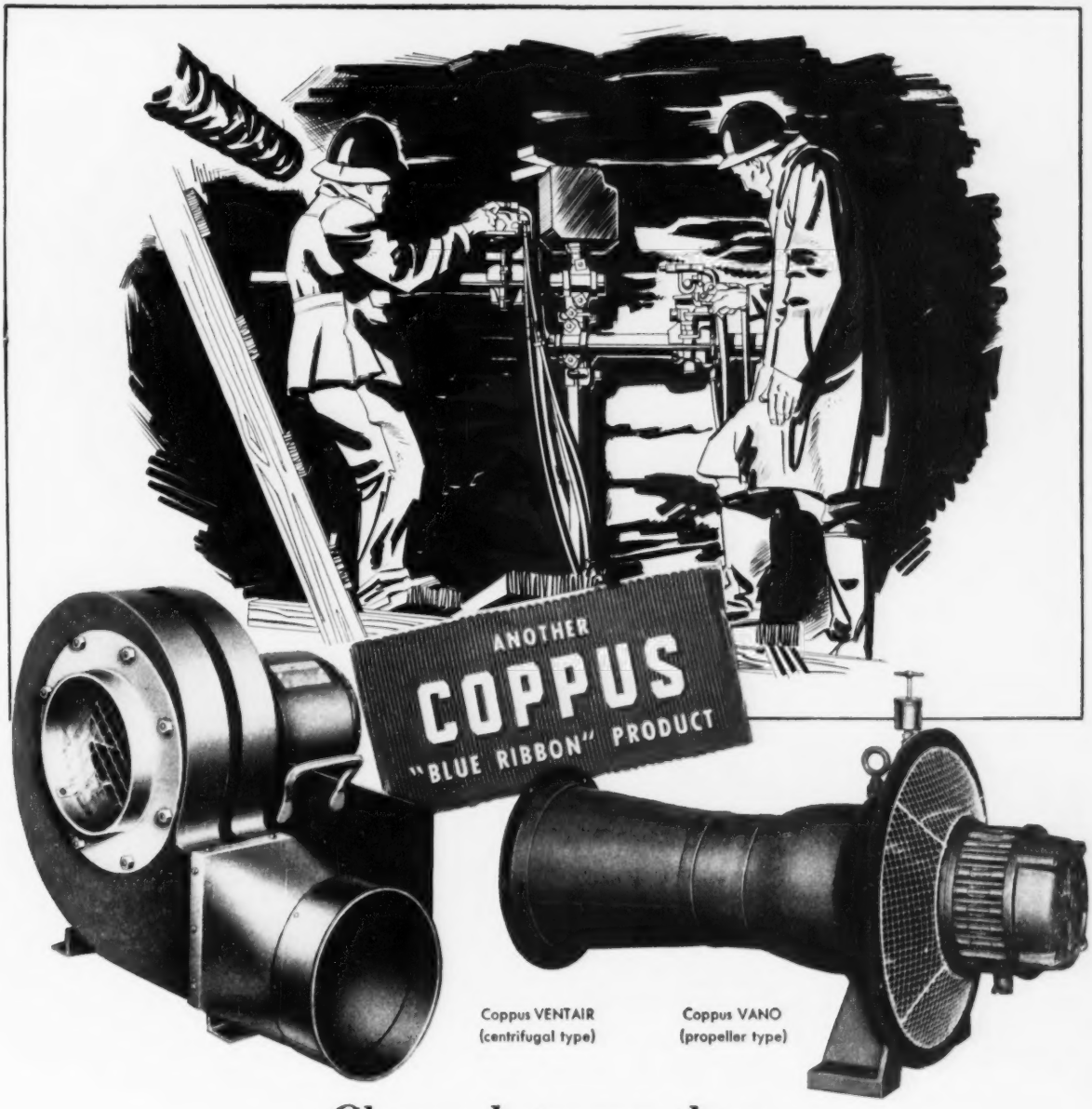
It was decided to locate the executive offices at the geographical center of present and future operations. Under the new plan, responsibility for operating mines and plants will remain decentralized, in the hands of resident managers. The metal sales and procurement functions will as before be operated from the company's New York office.

★The new contract signed by **Calumet & Hecla, Inc.,** and the United Steel Workers of America, CIO, will remain in effect through April 30, 1954. Meanwhile, company and union will undertake a joint job-evaluation study, working toward the correction of wage inequities. In June, 1953, company and union will negotiate on the basis of results of the joint wage survey. In addition, the company has agreed to make a study of mining contract rates and will meet with the union each month to discuss matters of mutual interest. Representatives of both company and union feel that the new contract is a step in the direction of constructive cooperation in working out mutual problems.

★Michigan College of Mining & Technology will conduct **research into prehistoric copper mining** in the Michigan copper country and Isle Royale, it has been announced by Dr. Grover C. Dillman, president of the college. The research, to be directed by Dr. Roy W. Drier, professor of metallurgical engineering, will attempt to answer seven questions: (1) Who were Michigan's prehistoric miners? (2) Where did they come from? (3) When did they mine? (4) Why did prehistoric mining cease so suddenly? (5) Where did the miners go? (6) How did they distribute the mined ore so extensively? (7) What was their means of transportation?

There are said to have been hundreds of prehistoric mine pits between Ontonagon and Isle Royal, many of which have been destroyed by later, large-scale mining.

★Residents of Ironwood believe that **earth disturbances** they have experienced have been caused by collapse of old underground workings in exhausted mines like the Ashland and Norrie, which have been inactive for many years.



Coppus VENTAIR (centrifugal type)

Coppus VANO (propeller type)

Choose between them and get 30% to 100% more air

Coppus Blowers are designed for two different types of mine ventilation requirements: the centrifugal Coppus VENTAIR is for long pipe lines; the propeller-type Coppus VANO for shorter lines . . . the correct selection will give you from ⅓ more to twice as much air — for a given power consumption — than an ordinary all-purpose fan.

Available for either compressed air or electric motor drive, both can be used as blowers or exhausters and are obtainable in capacities up to 90,000 CFM.

Only Coppus makes both these types, one of which will give you better, more economical mine ventilation . . . know them by the "Blue Ribbon" that symbolizes the engineering and production skill behind every Coppus product.

Representatives listed in MINING CATALOGS. Other Coppus "Blue Ribbon" products: steam turbines, gas burners, heat killers, air filters, blowers and exhausters for special purposes. See also THOMAS' REGISTER . . . Coppus Engineering Corporation, Worcester 2, Mass.

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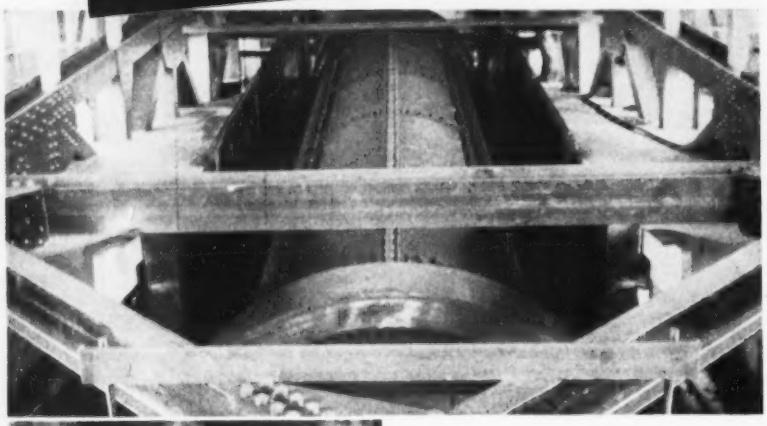

YUBA makes Abrasion Resisting Steel Screens, flat or revolving, for all screening purposes—separating, scrubbing, sizing. Holes are taper drilled to prevent clogging, can be small and closely spaced for screening sands bearing monazite and other rare earths. All thicknesses from ¼" up; other dimensions as big as your needs—screen shown is 50' long, 9' diameter, weighs about 65 tons. Competitive prices—ask for quotations.

YUBA-built conveyor pictured can handle 1440 tons per hour, is part of nearly mile-long conveyor system carrying crushed rock (minus 8") from pit to plant to stockpile. Yuba has built hundreds of heavy-duty conveyors for rock, gravel and sand since 1909. Put this experience to work on your conveying problems NOW.

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Zinc

(Continued from p. 84)

Ministry of Supply agreed to freeze the major portion of its excess stocks and the London market opened at close to the European price. The United States price promptly advanced to 13.0¢ but there was some doubt that this price would be held.

It was evident at the end of the year that consumers were reducing stocks in anticipation of lower prices. On the other hand, it was becoming increasingly evident that the low prices here and abroad were curtailing mine output.

With the Federal Reserve Board Index of Industrial Activity at a postwar high of 229 in November and business forecasts generally agreeing that this rate would continue well into 1953, zinc consumption may very well reach a new high and achieve the 960,000 tons indicated in the chart. Such a consumption will most assuredly require a higher price level to provide the domestic production necessary if we are to avoid placing too much of our dependence on foreign supplies.

MINNESOTA

★**Oliver Iron Mining Division** is stripping at seven mines in the Virginia-Eveleth district, six in the Hibbing-Chisholm district, five in the Cantisteo district, and the Pilotac taconite mine at Mountain Iron. Ira O. N. Swanson, of Virginia, Minn., is general superintendent in the eastern district; John H. Hearding, Jr., in the Hibbing-Chisholm district, and E. A. Friedman, of Coleraine, in the Canisteo district.

★**M. A. Hanna Co.** will complete three plants during 1953: a crushing and screening plant at the Enterprise mine, near Virginia; a crushing, screening, conveying, and washing plant at the Carlz mine, near Keewatin, and a crushing, screening, and washing plant and inclined hoist installation at the Morton mine, near Hibbing.

★A temporary increase of 10¢ per ton in ceiling rates for transportation of iron ore by Great Lakes ore-carriers has been granted by OPS, retroactive to July 27, 1952. It expires Dec. 31. The new rate is $1.55 per ton.

★Before the state legislature's interim commission on iron ore taxation, Oliver Iron Mining Division's president, R. T. Elstad, testified that the extent to which the steel industry will rely on "foreign importations" in the future depends upon the cost of producing Minnesota **taconites and low-grade ores** "to replace the diminishing

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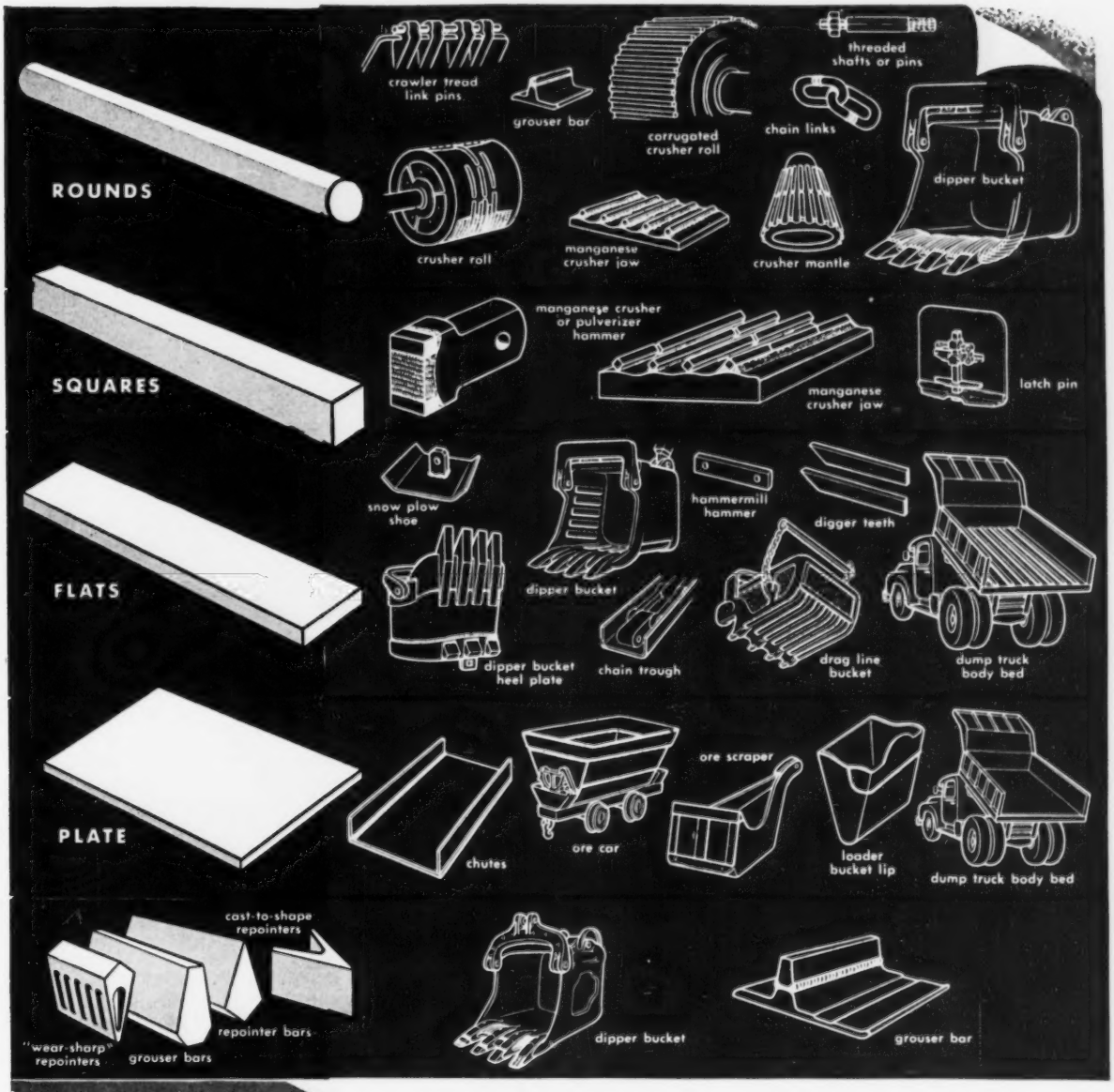

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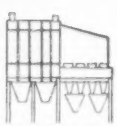

PRECIPITATOR-CYCLONE COMBINATION

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DUST HOPPER VALVES

Minnesota *(Continued)*

supply of natural direct-shipping ores."

★**When the last ore boats** of the past season had left the Duluth-Superior harbor, the season's goal of 75-million tons was 89,202 tons short of fulfillment. In the previous season, 82,092,-012 tons was shipped, while shipments of 106 million tons has been predicted for 1953.

★**Cleveland Cliffs Iron Co.**, of Cleveland, paid $2.2-million for land embracing the Boeing mine in Hibbing "to take a look," said President Alexander C. Brown, "and see whether more iron ore could be produced from it." Former owners of the property include the Washburn estate, Northern Minnesota National Bank, Mr. and Mrs. Royal A. Alworth, Herbert A. Dancer, and Louis E. Sundby. The Boeing was a wet mine and, due to viscosity of the ore, underground ore-cars were fitted with special couplings which permitted each car to be completely inverted in a cylindrical car dumper at the shaft pocket. Rhude & Fryberger have already begun stripping.

MONTANA

★Open-pit mining of fluorite deposits on Crystal mountain in Ravalli County, southeast of Darby, will be resumed in the spring by **Cummings-Roberts Engineering Co.**, of Compton, Calif., in behalf of **U. S. Steel Co.**, which has the lease. Glenn Hawe, Cummings-Roberts superintendent, said that at the time of the winter shutdown about 250 tons was being produced daily. The ore is said to run 96% calcium fluorite, and it is possible that it may be up-graded for manufacture of hydrofluoric acid. Reserves are estimated to be sufficient for 12 years. Owners of the property are A. E. Cumley, R. D. Flightner, and Lester Thompson, all of Darby, who, it's said, receive a royalty payment of $7.50 a ton loaded at the shipping point. The material is billed to the U. S. Steel plant at Geneva, Utah.

Bureau of Mines has completed a report on the district, prepared by John W. Taber, former Bureau engineer, now with Cummings-Roberts.

★**Caledonia Silver-Lead Mining Co.**, of Kellogg, Idaho, has been conducting tests to determine commercial uses for its dickite clay deposit in Fergus County, near Lewistown. A pilot plant is expected to be built some time this year.

NEVADA

★**Kennecott Copper Corp.** has announced plans to install more equipment at its McGell plant to increase

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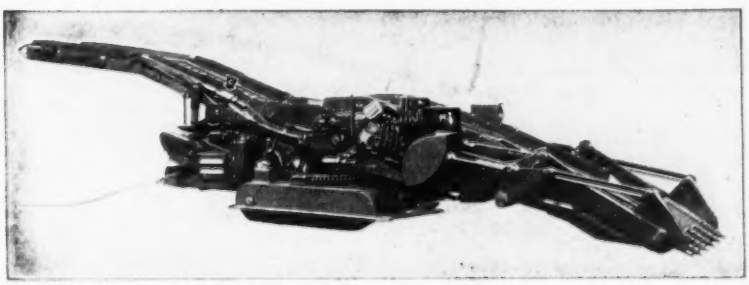

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Nevada *(Continued)*

output from 20,000 to 28,000 tons of ore per day. The plant will also be able to handle an additional 8,000 tons daily to be produced from the deep Ruth project by mid-year.

★Tungsten ore running as high as 10% scheelite is reported at the Baxter mine in the Gabbs area of Nye County. Ore is being handled by skip loaders and shipped to the **U. S. Vanadium Co.** mill at Bishop. A recent shipment of 58 tons running more than 8% scheelite is reported to have returned $30,000 net from the mill. Thomas Hancock, of Lone Pine, Calif., is associated with J. H. Baxter, of Gabbs, in the operation.

★**George Green Mining & Trucking Co., of Willets, Calif.**, has taken a 10-year lease on an iron mine 29 mi. south of Gabbs Valley on a royalty basis and begun to mine it. The property is owned by Harry Howard, George H. Douglas, Claude W. Douglas, and Andy Barrow, all of Fallon. A magnetite vein 130 ft. wide and approximately 1,000 ft. long is known to exist on the property. Plans are to ship about 500 tons daily.

★**Black Rock Mining Co.** has petitioned the Colorado River Commision for 15,000,000 kw. hr. of electricity a year for use in a newly developed tungsten-mining project in the Tempaiute district of Lincoln county. The company said it presently handles 650 tons of tungsten ore daily with a crew of 158 men but wants to expand its operations to handle 2,150 tons daily with a crew of 350 men. They reported sufficient ore has been blocked out to continue operations for 20 years. Power is now supplied by diesel generator, but the company said this might prove too expensive for expanded operations.

NEW HAMPSHIRE

★Robert F. Sherwood, of New York (formerly president of United Feldspar & Mineral Corp., 10 E. 40th St., New York) has just taken a lease on **the Stoddard fluorspar mine**, 12 mi. west of Keene, plans to mine acid and metallurgical-grade fluorspar.

Bureau of Mines geologists have established the fact that the orebodies are lenticular. "But what is important that our geologists have recently found out," reports Alex Labounsky, president of **Process Machinery Corp.**, New York, and associated with Mr. Sherwood in the fluorspar enterprise, "is that these orebodies slant at a steep angle southward, conforming to the tensional openings location on the south limb of the anticline. This fact establishes downward extension of the fluorspar deposits, increasing in value with depth." He described the objective of the main workings—from which

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New Hampshire *(Continued)*

thousands of tons of fluorspar have been mined in the past—as a 550-ft.-long quartz vein averaging 8 to 10 ft. in width (more than 15 ft. near the middle) and going more than 100 ft. in depth. He estimated 400 tons of fluorspar ore would be found per ft. of depth, cited the freight differential and expansion of the mining industry in New England and recent improvements in fluorspar recovery by flotation as favoring the undertaking.

Labounsky reported that two diamond-drill holes near the north end of the main vein indicated fluorspar to 150 ft. in depth across a width of more than 25 ft.

Immediate plants call for drilling to 1,500 ft., sinking a vertical shaft to that depth, and working out fluorspar lenses at several levels in stopes.

NEW MEXICO

★Construction of a new plant to produce sulphate of potash in the Carlsbad district will be undertaken as soon as possible—probably within the next few months, A. Norman Into, vice president of **International Minerals & Chemical Corp.**'s potash division, announced. He said the plant will go into production early next year, augment International's sulphate of potash output by 35,000 tons a year.

★Potash mining in Eddy county has more than taken up the slack due to cut-downs in zinc operations. With five companies in full swing, the prospects are for activation of three more mines in the Carlsbad district within the next two years. **Freeport Sulphur Co.** has completed exploration and will sink its first entry into an orebody 34 mi. east of Carlsbad. In the same general area, **International Minerals & Chemical Corp.**'s potash division G. T. Harley, resident manager, at Carlsbad) plans to open a second mine, increasing refining capacity at the older mine to take care of the new production. **American Potash Chemical Corp.** plans to start drilling 40 mi. east of Carlsbad early this year. (T. F. Hudson, Los Angeles, is assistant vice president of American.)

★**Anaconda Copper Co.**'s uranium mill near Bluewater, Valencia County, may not be ready for operation until late in the summer due to delays in getting steel and equipment deliveries, but stockpiling of ore from the surrounding area is going on. J. B. Knaebel, of Grants, is manager of New Mexico operations.

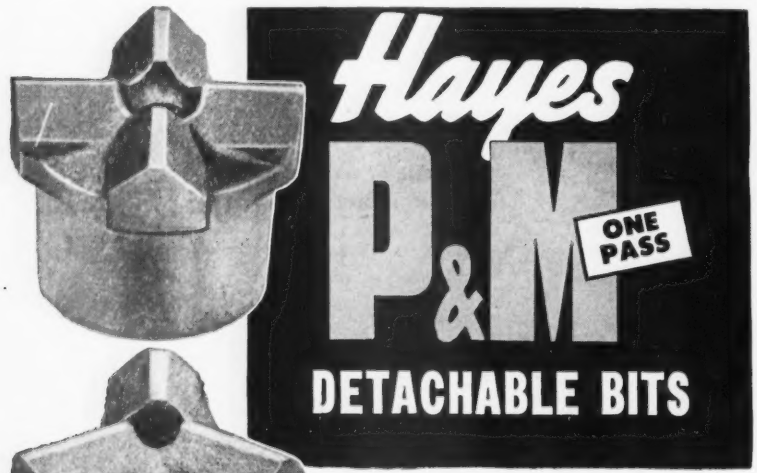
★**New Mexico Copper Corp.**, of Carrizozo, Lincoln County, is reported buying additional equipment to step up production of fluorspar, copper, silver, and lead at its Conquer mine, 11 mi. southwest of Corona, in the same county. C. E. Degner, president, of Carrizozo, said the crew of eight men will be increased to 25; also that development will start at the Surprise Park Mine in the Sierra Blanca mountains, south of Carrizozo, to produce copper and silver.

OREGON

★Planning for development of nickel ore deposits in southwest Oregon's Douglas County by **Hanna Coal and Ore Corp.** is shaping up as the largest mining investment in the state in more than a quarter-century. Certificates of necessity authorizing quick tax write-offs already total $25.6-million for the Nickel Mountain proposals culminating several years of exploration and claim activity.

DPA's authorization of a 70% write-off in five years for $22-million worth of ore processing facilities closely followed one permitting Hanna an 85% write-off on $3.6-million worth of mining facilities in the Riddle vicinity. How soon Hanna will start construction was uncertain. Hanna Development Co. representatives, Geologist Walt Foster and Engineer Ray Rannells, at Riddle, have avoided any committment on dates.

Nickel Mountain holds low-grade nickel-silicate representing the largest



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Oregon *(Continued)*

known body of the ore in this country.

★New use of **basalt as a plant food** raises the possibility of mining and processing the rock, which underlies most of Oregon and is quarried extensively in the state, for sale to gardners for treatment of compost piles and as a soil conditioner.

★Oregon and California mines yielded about **15,695 tons of chromite in 1952**, according to an estimate by F. W. Libbey, director of the State Department of Geology and Mineral Industries. This compared with a 1951 production of 6,897 tons. Output increased sharply when the government's Grants Pass ore-purchasing depot was opened in the fourth quarter of 1951.

TENNESSEE

★**Monsanto Chemical Co.** reports that its Columbia unit in Maury County—said to be the world's largest producer of elemental phosphorous—now employs 500 and carries an annual payroll amounting to more than $1-million. The plant, which has been shipping its output to Anniston for conversion to phosphoric acid and phosphorous compounds, now operates six furnaces, one of which—a 25,000-kw. electric unit—is believed to be the largest of its kind in the world. Monsanto estimated its 1950 annual capacity at 120 of the 207-million-lb. national output for that year. E. J. Bock manages the Columbia plant.

Production of Monsanto's Columbia plant and that of **Victor Chemical Co.'s** Mt. Pleasant plant—when augmented in the near future by that of a furnace being installed at Columbia by **Shea Chemical Co.**—will add dimension to Maury County's global stature as an elemental phosphorus producer. The three companies will then be operating a total of 11 furnaces in the county.

★Full-scale production is scheduled for next month at the new Waelz kiln of **Appalachian Mining & Smelting Co.**, of Embreeville. The kiln, at Bumpass Cove, produces zinc oxide by volatalizing and precipitating it. It's 140 ft. long, 9 ft. in diameter. The oxide is smelted by New Jersey Zinc Co. The operation is covered by a $3.5-million government contract.

Mining is for the present exclusively open-face or strip, but plans call for sinking shafts later, possibly to a depth of 1,000 ft. About 100 men are employed in the operation, which is highly mechanized. Herman D. Wynn, Knoxville, is chairman of the board; George Warren, New York, president.

UTAH

★With major mines shut down in Park City and a smelter closing, **Utah's hard-rock mining industry** entered 1953 with misgivings. Miles P. Romney, manager of Utah Mining Association, estimated that, as a result of declining metals prices over the past two years, Utah will lose some $13.8-million in 1953. His figures were based on predictions that lead-zinc prices will remain at year-end levels.

★A $1.5-million uranium mill is being planned by **Vanadium Corporation of America** in the vicinity of Hite, on the Colorado River in the Garfield-San Juan County region. Jesse Johnson of the raw materials division of AEC has reported a mill is to be built near Shiprock, N. M.; likewise in the Colorado plateau country.

However, a vanadium spokesman has told Utah mining officials no firm cost figure for the mill has been fixed, estimates ranging from $1.5 to $3-million. The mill would serve production of the White Canyon area.

★**United States Smelting Refining and Mining Co.** is putting trees back into the slopes of Utah's Oquirrh Mountains. About 10,000 conifers have already been set out on mountains west of the firm's Lark mine, and 15,000 to 20,000 pine seedlings are scheduled for planting in 1953. The program is expected to yield mine timbers and other useful growth in some 30 years. An immediate effect will be improvement of water supplies at Lark and other communities.

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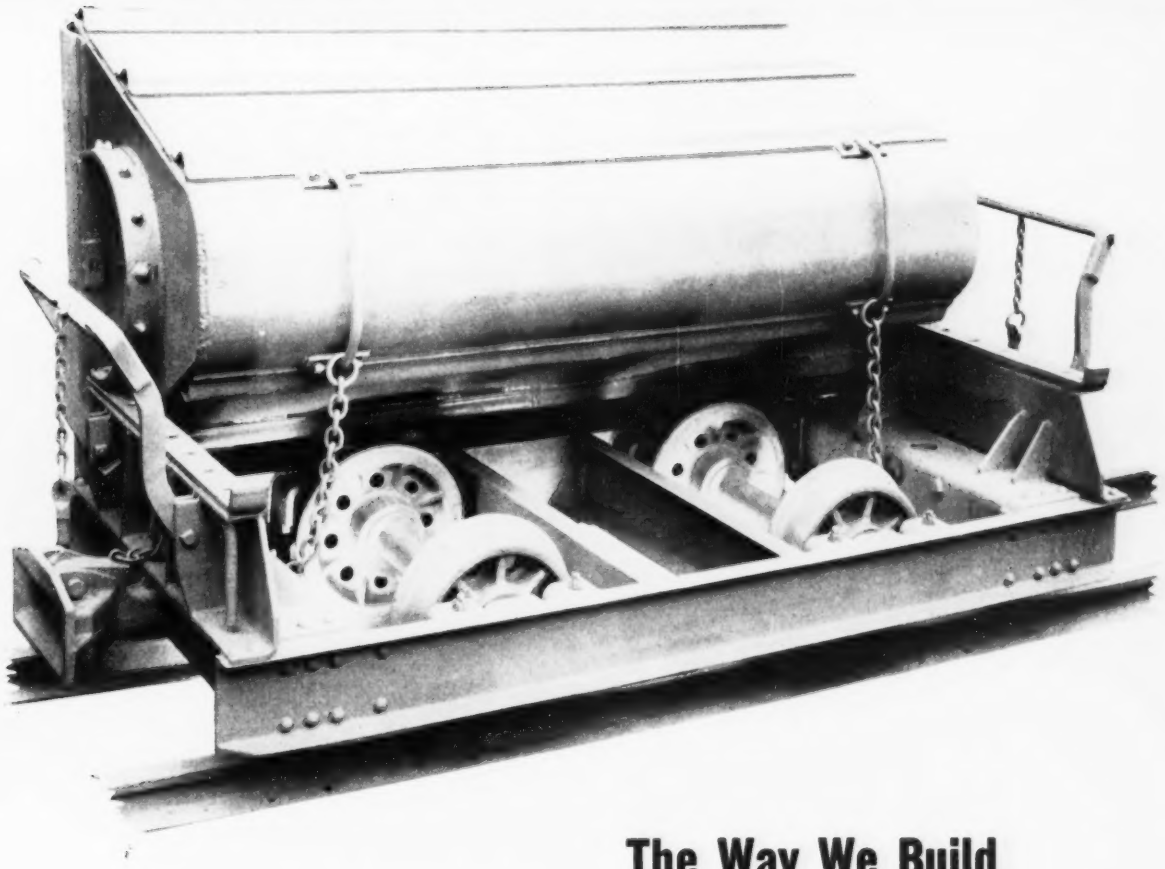
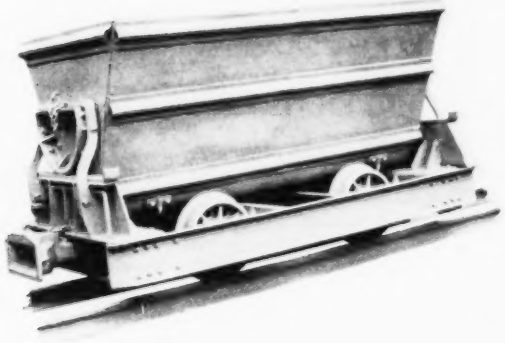


The two photographs in this ad show the S-D Rocker Car in detail while in hauling and dumping position.



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Here's why more than 32,000 mine cars have been built with U·S·S COR-TEN steel

● U·S·S Cor-Ten is a ductile, low-carbon chromium-nickel-silicon-copper-phosphorus steel having a minimum yield point, in thickness of ½" and under, of 50,000 psi—at least one and one-half times that of structural carbon steel.

It has a minimum tensile strength of 70,000 psi in these same thicknesses. Its resistance to abrasion and shock is superior to structural carbon steel; its fatigue resistance—that is, its ability to withstand vibration stresses—is 60% greater.

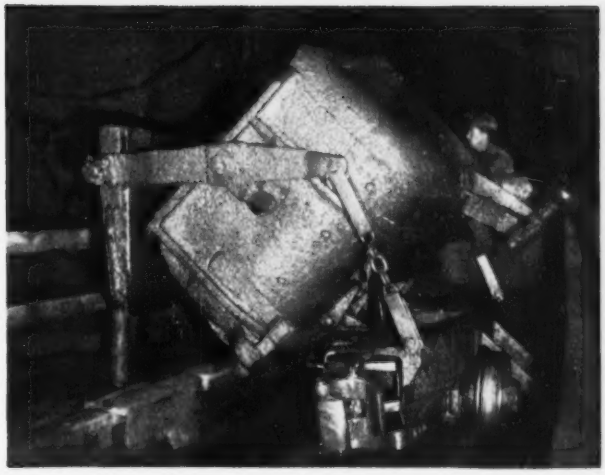
What particularly distinguishes U·S·S Cor-Ten steel is its very high resistance to atmospheric corrosion—4 to 6 times that of plain steel, 2 or 3 times that of copper steel. This property helps to assure the safety, long life and low maintenance cost of any equipment in which Cor-Ten steel is used, whether to obtain greater durability, or in lighter thicknesses to reduce weight.

U·S·S Cor-Ten High Strength steel is produced in all standard products—plates, shapes, bars, sheets, strip, special cold formed sections, wire and tubular products. It is recommended particularly in light and intermediate thicknesses.

★

Twenty-two 74-cu. ft. mine cars put into service eleven years ago. ¼" COR-TEN steel used in body and floor plates. Each car has handled over 85,000 tons of highly abrasive ore.

★



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will give your equipment the stamina to stay on the job!

BUILT in 1941 by the C. S. Card Iron Works Company for a western copper mine, 22 mine cars were designed to be used with a 12-inch grizzly.

Instead, for eleven years, they have been loaded from a 24-inch grizzly, handling chunks of very abrasive ore up to 2′ x 4′ in size—twice as big and twice as heavy as they were designed for.

Despite this, and after operating day-in and day-out under highly corrosive conditions, the cars are still on the job and ready for more service, although each car has already handled more than 85,000 tons of ore.

This case is typical. It illustrates the added ruggedness and durability that you can confidently expect when your equipment is built with U·S·S COR-TEN steel.

With this tougher, stronger steel that offers high resistance to atmospheric corrosion, to wear, impact, shock and fatigue, you can materially increase the stamina of parts without increasing their weight. With U·S·S COR-TEN steel, not only mine cars, but buckets, skips and cages, shovels, trucks, scrapers, dozers, carryalls, etc., can be built to last longer and to do more work.

For 17 years our engineers have cooperated with the mining industry in applying U·S·S COR-TEN steel to equipment noted for its dependability, long life and low maintenance cost. We will be glad to show you how this superior high strength steel can be most economically applied to make your equipment more efficient.

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UNITED STATES STEEL

WASHINGTON

★USGS has published a map, **Geological Environment Map of Alumina Resources of the Columbia Basin,** that may prove important to Northwest's aluminum industry. A footnote says, "The **high-alumina clays of the Columbia basin** contain titanium, iron and gallium, all potentially recoverable." Spokane and Whitman are the Washington counties shown to contain these deposits. A copy is at the Surveyor's regional office at Spokane, and copies may be ordered from the agency's headquarters at Washington, D. C. The Bureau of Mines has been trying to develop economical processes for alumina recovery from clay.

★**Howe Sound Co.'s** copper-zinc-gold operations at Holden, in Chelan County, have reduced output about 25% in order to meet the government's 10%-power-cutback order reported John J. Curzon, manager. The mill is handling about 1,500 tons daily, compared with 2,000 tons formerly. Curzon said the company cut out one primary ball mill and one regrind mill.

★The possibility of nickel and cobalt content at **Gold Bond Mining Co.'s** mine in the Blewett area of the Cascade Mountains is being investigated by a group interested in leasing it, said Frank Lilly, president.

WISCONSIN

★**Homestead Mining Co.,** of Grant County, (G. H. Pett, of Platteville, president, and Ernest Rasque, Platteville, vice president and general manager) is making a complete change in crushing equipment in view of the special difficulties encountered in handling the wet viscous material indigenous to this district. In place of the old ball mill, homestead is installing a Lipton 36 x 18-inch jaw crusher which will crush all mine ore without grizzlying. Secondary crushing will be done by a 30 x 18-inch set of Telsmith rolls. All material from the first set of rolls will be fed to a 36-inch x 8 ft. trommel screen, which will send the oversize to 24 x 14-inch Galena Iron Works rolls, and the undersize will go to a drag that will feed the jigs. During the change-over, all mine ore is being stockpiled underground.

DIFFERENTIAL PRODUCTS INCLUDE:

Locomotives, mine cars, mine supply cars, rock larries, mantrip cars, air dump cars, dumping devices and complete haulage systems.

Over a quarter century ago the first (and original) double-trunnion dump car was placed in service by Differential on the L & N. Sound engineering and careful workmanship were such that this car is still in service — still earning money for its owners.

Such details as hardened, self-lubricating pins in door mechanisms, rolled steel weldments instead of castings (making repairs easier when repairs are necessary)—these are examples of details that put Differential in the lead more than 25 years ago — and keep it there!

Send for Bulletin 56 and get more information on this pioneering air dump car.

DIFFERENTIAL STEEL CAR COMPANY

FINDLAY, OHIO

SINCE 1915 — PIONEERS IN HAULAGE EQUIPMENT

IN ALASKA

★It is reported from Juneau that **Aluminum Company of America's** Taiya project is being supported by **Hudson Bay Mining & Smelting Co.** R. H. Channing, Hudson Bay president, has said he feels the Canadian Government should permit some of the Yukon river water to be diverted to the south so ALCOA could proceed with its project.

★**Clay along the Healy River** is reported to be the type used by brick and tile companies. A report from Fairbanks says George Gale is negotiating with a U. S. company to start a factory at Healy.

★It is said the limestone mountain near Cantwell may be the means of setting up **a cement plant.** Jim Hefferson, of Fairbanks, reported Alaskan interests were considering that possibility. He said limestone could be hauled to the coal mines and vice versa.

IN CANADA

★Canadian metal-mine dividends set a new all-time record in 1952, totaling $145,240,412. Best previous year was 1951, when the total reached $140,607,099. Cumulative total to the end of 1952 exceeds $2.3-billion.

The year's good record was made possible by the base metal mines, the "big four," **Consolidated Smelters, International Nickel, Noranda,** and **Hudson Bay,** maintained their 1951 rates, while larger payments were made by **Waite Amulet, Quemont, Placer Development, Sheep Creek,** and **Silbak Premier.** The total was swelled also by several newcomers, including **Anaconda Lead, Reeves McDonald,** and **Western Exploration.** Not so bright was the showing made by the gold

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High Voltage Cable

No metal armor or lead sheath, yet . . .
There's even greater mechanical and electrical protection in the combination of *neoprene jacket* and *butyl insulation*.
Together they provide:
Unequalled protection from impact, crushing, twisting and abrasion.
Higher dielectric strength.
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Less weight, more flexibility; easier to handle, install, splice and maintain. Lower first and final costs!

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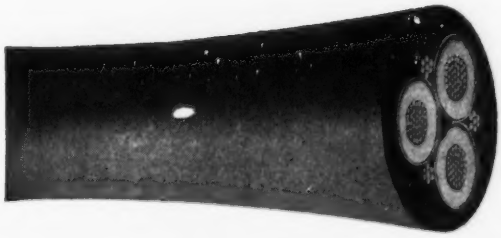
Anaconda Butyl-Insulated High Voltage Cable is the modern cable for any mine—particularly mechanized mines. Anaconda also specializes in the manufacture of shuttle car cable and cable for the new continuous mining machines. Let our mine service specialists show you, or get in touch with your near-by Anaconda Distributor. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.



the right cable for the job

ANACONDA®

WIRE AND CABLE

Canada *(Continued)*

mines: 36 companies distributed $17.5-million, compared to 36 that paid out $19.3-million in 1951.

For 1953 a lower total of dividend payments is in prospect. The gold mines will reduce dividends again unless some unexpected turn of good fortune appears; and the base metals have already started reflecting the lower prices for lead and zinc. Consolidated Smelters has reduced its January payment to 75¢, compared to $1.20 in January last year, a cut of $7.3-million, and **Golden Manitou** has omitted the 5¢ payment that was expected in January.

★**Total mineral production of Canada for 1952** was worth $1,278-million, the Dominion Bureau of Statistics estimated. Lower prices for lead, zinc, gold, and various other metals were offset by increased production of oil, zinc, nickel, tungsten, and structural materials. Down in volume but up in value was asbestos, with a gain of $7-million.

BRITISH COLUMBIA

★With curtailment of production in base metal mines, due to a drop in prices complicated by a temporary shrinkage of smelter capacity, miners are voting in favor of a division of work through **a shorter week rather than mass layoffs.** Six hundred workers **at Canadian Exploration** mine at Salmo already have voted, 2 to 1, for a four-day week, and Harvey Murphy, regional director of International Union of Mine, Mill and Smelter Workers, said the regional convention of IUMMSW early this year likely would adopt division of work as policy.

★**Consolidated Mining & Smelting Company of Canada** has been forced to cut production at its Trail smelter and chemical plant because of the power shortage in the Kootenay district due to the prolonged water shortage. Zinc output was slashed 25%, putting a new squeeze on metal mines which normally ship to Trail. The smelter previously announced it could not handle any new zinc concentrates, forcing some new and expanding mines to go outside the province with their shipments. Shipments of zinc concentrates to Trail were running about 5300 tons a month, compared to 7900 tons a month during the first nine months of 1952.

★**Columbia Cellulose Co., Ltd.,** has completed installation of new equipment at its high-alpha pulp plant at Port Edwards, near Prince Rupert, to extract sulphur from pyrites recovered in flotation of ores at **Britannia Mining & Smelting Co.'s** Howe Sound plant. W. C. R. Jones, Columbia plant manager, described the operation: pyrites are burned in a furnace, giving off sulphur dioxide gas, which is piped directly to the pulp mill's acid-making system. He said the plant's continuous operation is assured regardless of world shortages and reduces sharply Columbia's reliance on imported sulphur.

★**United States Steel Corp.** has taken out registration papers in British Columbia as an extra-provincial company.

★**Giant Mascot Mines, Ltd.,** has been producing 1-million lb. a month of lead at its Spillimacheen plant and now claims to be second only to Consolidated Mining & Smelting Co. as a lead producer. The plant has also been turning out 100,000 lb. of zinc and 10,000 oz. of silver a month. Mine manager is F. R. Jones.

★**Estella Mines, Ltd.'s** property at Wasa earned an estimated operating profit of $19,200 in November, compared to loss of $31,000 in October, and the company's $79,000 bank debt has been wiped out. Griffith Annesley took over administration and direction of the mine Nov. 1.

MANITOBA

★**Cyprus Exploration Corp., Ltd.,** has acquired by staking and option approximately 200 claims in a new uranium area near Dion Lake in the Herb

Using a Sauerman rapid-shifting scraper machine, the 60 tons of clay required hourly in operating the new wet process cement mill of La Tolteca Cia de Cemento Portland, in Hidalgo, Mexico, is produced cheaply from a huge nearby hill. The scraper digs from top to bottom of the hill and delivers to a hopper at the wash-mill.

In former years, clay was dug from the hill with picks and shovels for a dry process mill at this same site. A gang of 58 men was used to loosen and shovel the clay into small cars that were hauled to the mill. Now one man and a Sauerman machine does all the digging and hauling as shown in the picture above.

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Boost Output! Slash Costs!

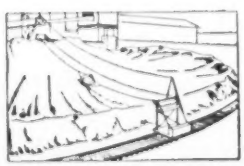
the SAUERMAN Way!

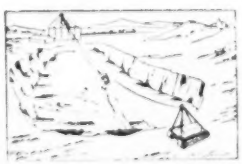
Savings in equipment costs, economy of operation, and rapid, efficient haulage over long or short distances are just three of the advantages that make Sauerman Drag Scrapers and Cableways a profitable investment for a wide variety of materials handling operations.

Sauerman machines reach across or into water or bog, down into pits, up to the top of a hill, or across a wide stockpile. The efficient Crescent Scraper or Cableway bucket is controlled by one man from a safely located operating station overlooking the work site. Need for sending men or equipment into soft or dangerous areas is eliminated. Only the most expendable parts of the equipment contact the material handled, so that wear is slight and maintenance is accordingly low.

There is a size and type of Sauerman machine suited to your particular requirements. The moderate initial cost of a Sauerman Scraper or Cableway will prove a highly profitable investment for you in terms of years of steady service at minimum expense.

Sauerman Scraper Excavator


Sauerman Scraper Stockpiler


Sauerman Slackline Cableway

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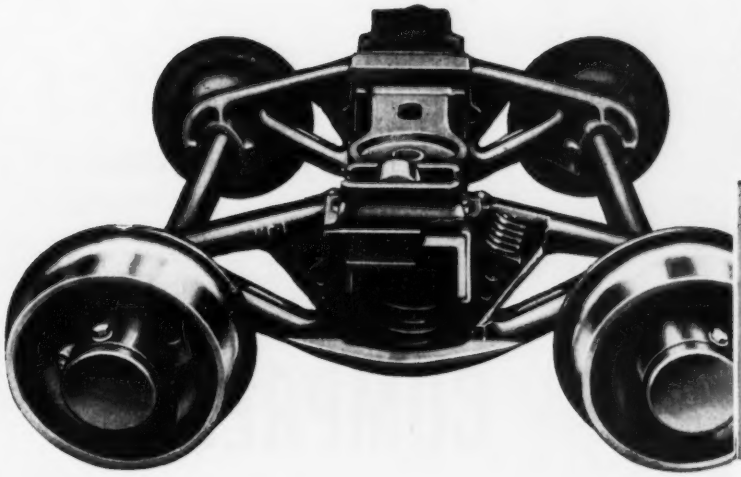
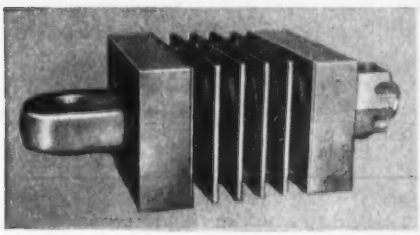


The NC-1 Truck climaxes 20 years of intensive research, providing (through the friction control mechanism shown in cutaway) protection to equipment, roadbed and lading with maximum wear life.

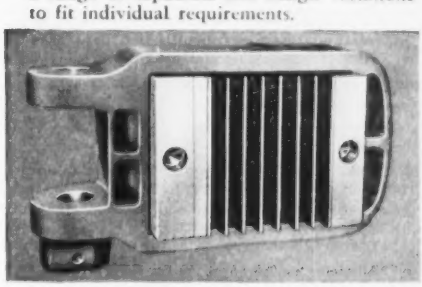
Willison Automatic Couplers save time with maximum safety . . . can be coupled at either end of car or locomotive . . . require no manual assistance. Close coupling eliminates damaging slack, permits high speeds with maximum stability.

NATIONAL *products cut per ton costs!*

Latest example of National's pioneering in better equipment is the NC-1 Truck. Its sweeping advancements over conventional trucks include long soft springs, a friction mechanism—controlling vertical and transverse oscillations, a cast one-piece bolster with large lubricated center connection, and automatic frame alignment. The NC-1 has been designed with the same factor of safety that is required by the Association of American Railroads for full size railroad trucks, and embodies the same features which A.A.R. tests have shown to be essential to produce good riding qualities. For the best in profitable equipment, *always specify National products.*



National M-230 Rubber-Cushioned Draft Gear for cars operating through rotary dump. Soft initial-action, high-capacity rubber pads provide maximum impact protection, lengthen equipment life. Available in a range of capacities and design variations to fit individual requirements.



M-225 Rubber-Cushioned Draft Gear for locomotives and large capacity cars not required to operate through rotary dump. Maximum protection in minimum space.

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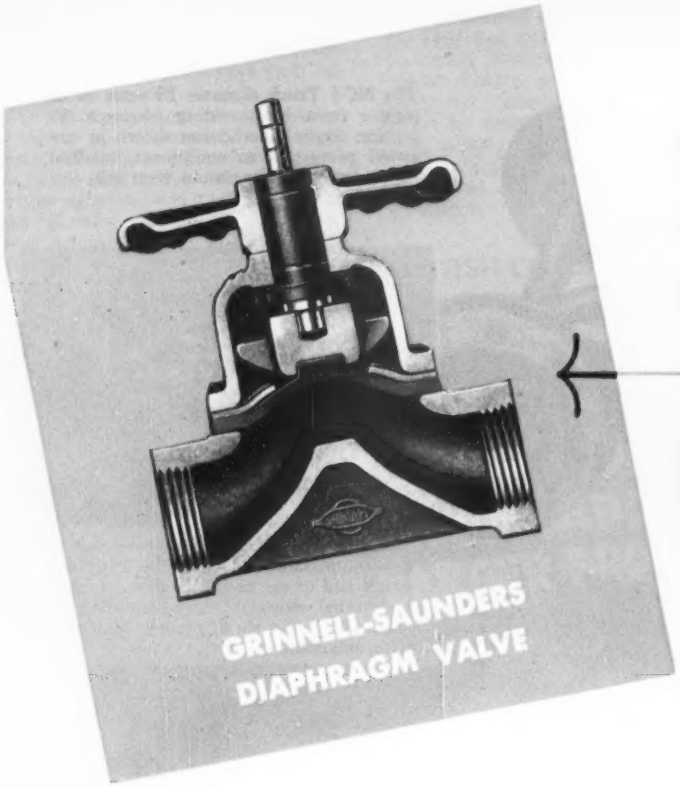
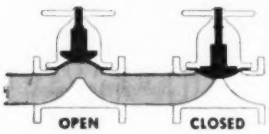


The valve originally designed to eliminate

COMPRESSED AIR LEAKS



Features which have made Grinnell-Saunders Diaphragm Valves the specified valve in many different industries:

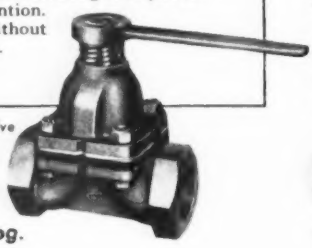
Streamlined flow. Smooth, streamlined passage, without pockets, prevents trapping of solids. Frictional resistance is at a minimum — regardless of direction of fluid flow. No disc holder in fluid stream.

Leak-tight closure against grit, scale, suspended solids. The resilient diaphragm, plus the large area of contact, gives leak-tight closure against pressure or vacuum.

Working parts absolutely isolated from fluid. Diaphragm completely seals off working parts from fluid in the line. No sticking, clogging or corroding of working parts. Valve lubricant cannot contaminate fluids.

Body, lining and diaphragm materials to meet service condition. Bodies stocked in cast iron, malleable iron, stainless steel, bronze and aluminum; other materials on special orders. Valve bodies lined with lead, glass, natural rubber or neoprene. Diaphragm materials of natural rubber or synthetics.

Minimum maintenance. No refacing or reseating is required. No packing glands to demand attention. New diaphragm can be inserted without removing valve body from the line.



Quick Operating Valve

Write for Grinnell-Saunders Diaphragm Valve Catalog.

A single 1/32-inch leak in an air valve can waste, in one month, the full cost of a Grinnell-Saunders Diaphragm Valve. In fact, that's why Grinnell-Saunders Diaphragm Valves were designed . . . to eliminate costly air leaks. Even when scale in the line becomes lodged on the valve weir, Grinnell-Saunders Valves give positive, air-tight closure.

The operating principle is simple. A rubber diaphragm, seating on metal, makes possible an absolute seal. At the same time, because working parts are wholly isolated, no packing glands are necessary, and stem leaks are impossible.

Successful on compressed air lines, it was only a matter of time before Grinnell-Saunders Diaphragm Valves were in demand for other type installations . . . handling materials as diversified as corrosive fluids, gases, beverages, foods, suspended solids . . . in lines where corrosion, abrasion, contamination, clogging, leakage and maintenance are costly factors.

Grinnell-Saunders Diaphragm Valves can be had with body, lining and diaphragm materials to meet different service conditions. Assign your next valve problem to Grinnell.

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pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
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Canada *(Continued)*

Lake area. The main showing is described as a contact zone between pegmatites and Keewatin sediments. Values occur as finely disseminated uraninite. Cyprus will commence drilling early in the new year.

NORTHWEST TERRITORIES

★A new chemical leaching plant was put into operation to recover uranium values from both current and stockpiled tailings at the Port Radium mining site of **Eldorado Mining and Refining, Ltd.**, Manager Harold E. Lake has announced. A sulphuric acid plant was built to supply the leaching plant.

ONTARIO

★Start of production by early 1955 is visualized by Marmoraton Mining Co., wholly-owned subsidiary of **Bethlehem Steel Corp.** developing a big open-pit magnetite iron mine near Marmora, southeastern Ontario (H. Olsen, Marmora, general superintendent). Surface drilling indicated enough ore to provide 500,000 tons of high-grade concentrate annually for 25 to 30 years. About 20-million tons of limestone capped the orebody from a depth of about 100-ft. The crushing plant and mill (2,500 tons daily) will probably be built this summer, and possibly a sintering plant. Concentrates will be shipped by rail to Picton for shipment across Lake Ontario.

QUEBEC

★Possibility that a new iron field is shaping up may be seen in the report by **Cyrus Eaton interests** that a medium to low-grade ore deposit "of almost unlimited tonnage" has been found on the west coast of Ungava Bay. The material is hematite. Preliminary tests suggest it is amenable to beneficiation.

IN LATIN AMERICA

BRAZIL

★ Brazil's iron ore—particularly that in deposits in Mato Grosso, Minas Gerais, and Amapa—is sufficient to enable the country to export it for many years in quantities far greater than heretofore, it is stated in a joint report issued recently by Brazil and

Pick a winning Card!

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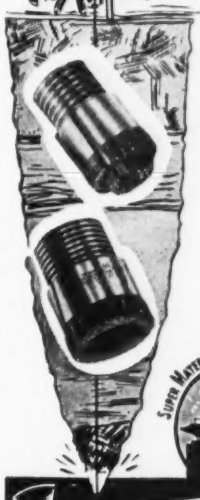

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Because, SMIT Technical Staff continually tests design AND performance of SMIT Diamond Drilling Tools in field trials to insure Lowered Drilling Costs and High Salvage Returns on all types of formations which may be encountered in your drilling operations.

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Recommended for drilling all types of ground except extremely broken or abrasive formations.

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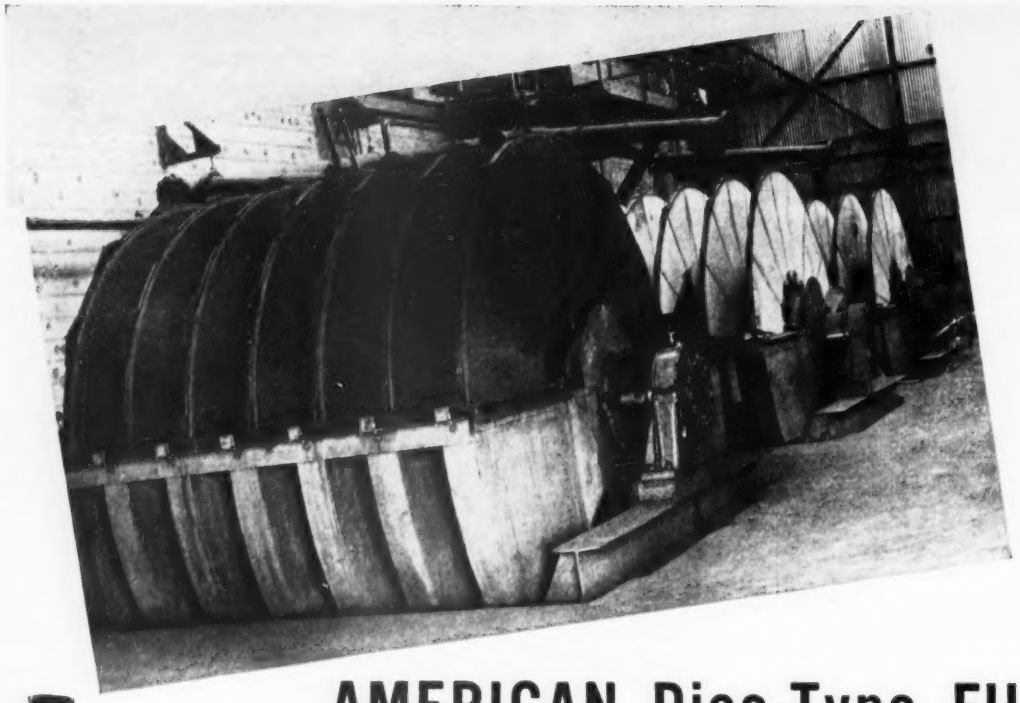
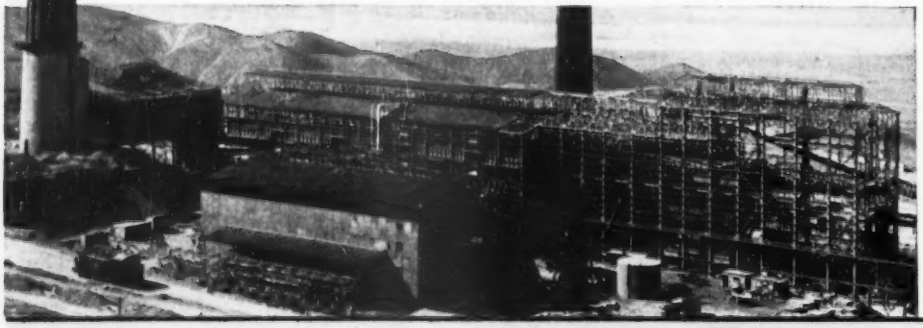


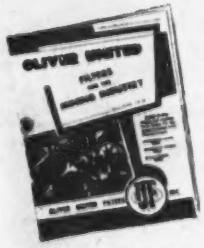
AMERICAN Disc-Type FILTERS

dewatering flotation concentrates at

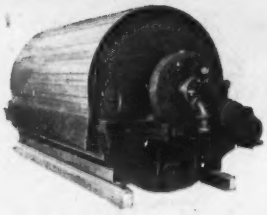
CHUQUICAMATA

Chile Exploration Company

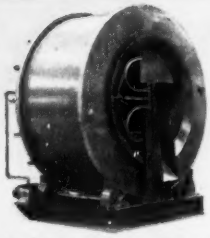




Send for our new metallurgical filter bulletin giving details of the Oliver United line of Metallurgical Filters. Of particular interest will be the two relatively new filters to the list of continuous vacuum filters—Oliver Horizontal Filter and Oliver Panel Filter. Just ask for Bulletin 20-M.



Oliver Continuous Filter . . . the pioneering automatic continuous vacuum filter in the country, brought out in 1907; long considered the standard throughout the mining industry. Standard sizes range from 18 to 790 sq. ft. of filter area.



Dorrco Continuous Filter...especially adaptable for dewatering heavy, fast settling solids. The drum acts as the tank with the cake forming on the inside of the drum. Standard sizes range from 18 to 783 sq. ft. of filter area.

CHUQUI

Another Leader Recognizes . . . and Buys
Quality in Filter Design, Construction and Service

Here at Chuquicamata, Chile, is the most important new mill in South America, designed to handle daily up to 30,000 tons of copper sulphide ore.

With few exceptions, whenever a 'feature' mill *anywhere in the world* goes into production, you can find Oliver United filters handling the dewatering and/or washing of the milled ores. What is it that so often induces those responsible for the selection of mill equipment, generally in widely separated and distant areas, to rely upon Oliver United equipment? Bearing in mind that there is something of a finality to the purchase of mining and milling equipment to be used thousands of miles and across oceans from the manufacturer, these two values, not to be found elsewhere, are strongly influencing factors:

- **One value is the acknowledged wide experience with and understanding of filtration practices throughout the world. Oliver United's service in this field goes back more than 45 years. Our engineers know ores and their filtration characteristics.**

- **The other value is the wide selectivity in filter types offered by Oliver United. For Chuqui, Americans were selected as being most suitable. Other mills have Olivers or Dorrcos. And now with the Horizontal and Panel Filters entering the filtration picture, each in a wide range of sizes, Oliver United *selectivity* looms even more important.**

Yes, this world-wide preference for Oliver United filtration equipment is basically a matter of *reliance* . . . reliance upon the services and equipment of the company long known in the mining industry as Filtration Headquarters. This reliable service is available to you in connection with your filtration problems.

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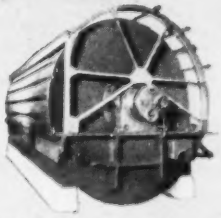
Oliver Continuous Vacuum Horizontal Filter . . . all essential operations visible to the operator at all times; gravity aids in flow of filtrate; excellent for dewatering and washing crystalline and fibrous products; counter current washing practicable. Standard sizes range from 3.5 to 165 sq. ft. of filter area.



Oliver Panel Filter . . . designed to operate with high capacity when handling pulps producing thin, sticky cakes or pulp with very small percentages of solids. No wire winding, although easily converted to the wire wound drum type of filter. Standard sizes range up to 790 sq. ft. of filter area.

Check up on our Olivite Acid-Handling Pumps and in ODS Diaphragm Slurry Pumps, both quite useful in and around ore-milling plants.

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Some products are in short supply but when shortages occur we can often supply practical alternates

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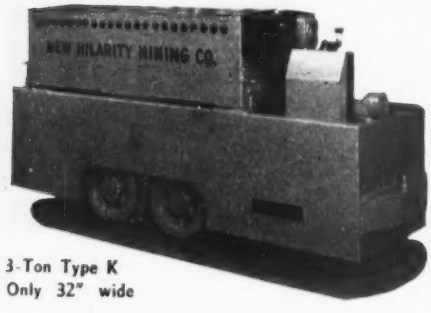

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Brazil *(Continued)*

the U. S. Commission for Economic Development. The report, a review of **the country's mineral resources,** recommends more vigorous exploitation to increase export of magnesite from deposits in Amapa and elsewhere but urges the dwindling reserve at Minas Gerais be earmarked for home consumption. It put known nickel reserves at 0.4-million tons, those of chrome at more than 0.5-million tons, described the tungsten reserve, found in scheelite in the northeastern part of the country, as abundant.

BOLIVIA

★The government will offer premium prices to producers, assure workers of adequate food supplies at minimum prices, furnish capital equipment, and post secret police in order **to encourage efficient production from gold deposits** at Tipuani, Guanay, and Umtulumi and channel it—not into illegitimate foreign markets — but to the Banco Minero de Bolivia. Initial production scheduled is 200 kg. a month, and this is to be increased later. About 6,000 workers are now employed at the three deposits, but officials of the gold department of the mines ministry estimated they could be developed to provide work for 10,000.

CHILE

★Secretary for Economics Torreblanca told a press conference **Chile would not nationalize its copper mines** and, in any case, had no money with which to buy them. The announcement came at a time copper producers were having the jitters lest the U. S. fail to extend suspension of the tariff on copper imports. The current suspension expires Feb. 15. Chile sells 400,000 tons a year to the U. S.

★Mining Associates, affiliate of the **Mining Society of Chile,** urged at a recent meeting in Santiago that the current exchange rate of 130 pesos to the dollar be maintained, opposing proposals for a new rate of 100 pesos per dollar. They also gave their support to the country's restriction of luxuries that may be imported in exchange for gold sold on the free market, advocated that a mines ministry be established and headed by an official of cabinet rank, moved for acceptance of a long-outstanding offer of the U. S. to lend Chile $15-million to develop the country's mining industry, and called for construction of a lead smelter, an electrolytic copper refinery, and a sulphuric acid plant that would make use of SO_2 from converters of the Paipote smelter.

★Chile has been losing 26-million lb.

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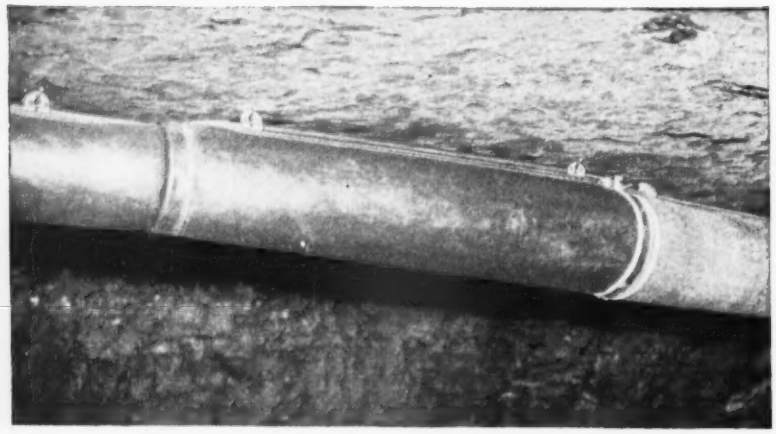

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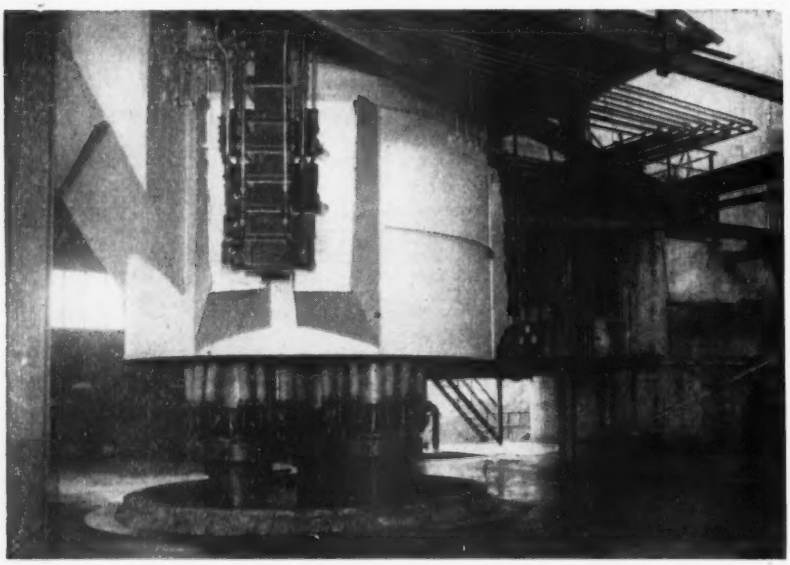

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Chile *(Continued)*

a month in copper output due to the strike of 6,200 employees of **Braden Copper Co.** The walk-out paralyzed mine, mill, smelter, railroad, and shops.

★In contrast to the huge operation of Chuquicamata—where output is expected to climb to 0.5-billion lb. of copper a year—there's **Caja de Crédito Minero,** Chile's mining bank, which buys gold, copper, silver, and lead ores in lots as small as one ton. Since 1932, the institution has bought 2.5-million tons of ores, treated 1.5-million tons at its cyanide and flotation mills and the Paipote copper smelter, and shipped the rest to foreign smelters. The bank is now building a new cyanide and flotation mill about a mile out of Illopel to treat 100 tons a day of copper or gold ores.

★Election of Rodolfo Miche's to the board of directors of both **Anaconda Copper Mining Co.** and **Andes Copper Mining Co.** was hailed at a dinner given recently in Santiago in Mr. Michels' honor as a milestone on the road to better relations between American business concerns and the Latin American countries in which they have interests. Michels, who is also vice president of Anaconda Copper Mining Co., is believed to be the first Chilean to hold such high office in an American firm operating in Chile.

DUTCH GUIANA

★**About 7-million tons of bauxite** has been blocked out in a newly discovered deposit at Orinobo, it is reported. The deposit lies on the north bank of the Para River, which is difficult of access, and beneath as much as 50 ft. overburden.

Another bauxite deposit, also situated so as to pose a transportation problem, is being prospected by the Surinam Government near the Marowyne River in the Nassau Mts.

FRENCH GUIANA

★Extent and feasibility of mining of tantalite ore deposits along the River Sinnamary is being investigated by experts representing the U. S. Government. The deposits are included in a concession held by a U. S. company, **Guiana Mining Syndicate.**

MEXICO

★Discounting published reports to effect **the nation's silver reserve** is being rapidly depleted, Gustavo P. Serrano, president of the Mining Chamber, said deposits remaining in Hidalgo, Mxico's foremost silver state, are sufficient to insure Mexican world

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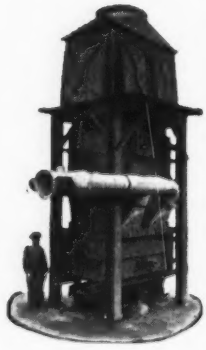

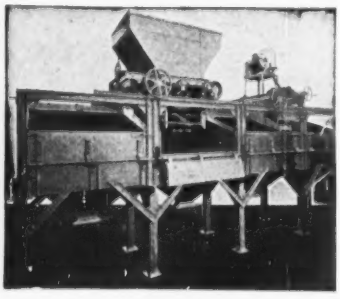

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Mexico *(Continued)*

leadership in silver output for many years to come. He cited as particularly rich, silver deposits near San Bartolo, in the Zimapan-Cardenal zone, and between Pachuca and El Chico.

★The **Confederation of Industrial Chambers** has endorsed the Mining Chambers' stand favoring lower and fewer taxes, a simplified impost system, expanded road and rail facilities, and a security guarantee for mining concessionaires. It's the little fellow, the Confederation maintains, who is hardest hit by shortcomings in these categories.

★**Mining labor contracts** will be revised during April and May. Enrique Rangel, union labor secretary, promised that the workers' representatives would stay within the bounds of equity and justice, tempering demands for pay boosts in accordance with the individual employer's ability to pay. At the same time, however, he threatened a general strike should the employers offer anything less than "decent wages."

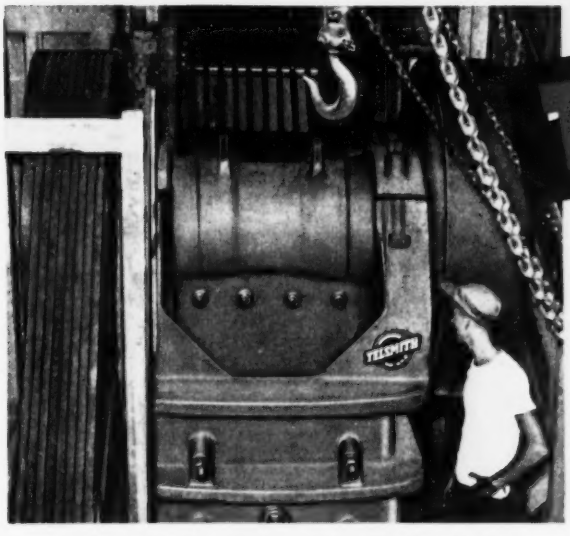
★Engineers of the Ministry of National Economy are measuring what is said to be the largest sulphur deposit yet turned up in Mexico, near San Cristobal, Minatitlan municipality, Vera Cruz. They reported that the sulphur rises naturally to the surface and can thus be mined without resort to treatment by the Frasch process. **Cia Azufrera Mexicana, S. A.**, is exploiting the land, which is the site of three projected refineries.

★**British capital** would be welcomed to participate in Mexican mining, Gustavo P. Errano, president of the Mining Chamber, told a British trade mission headed by Brigadier-General W. H. Crosland. He said the larger mining enterprises are controlled by U. S. interests and are in a sound condition but pointed out that smaller operations are handicapped by lack of capital to build their own refineries and the necessity to ship zinc, lead, copper, and iron ores to facilities of the larger companies in Mexico and Texas.

PERU

★A pier and other facilities are being constructed at the southern port of San Juan by **Utah Construction Co.**, of San Francisco, in connection with the company's program for exploitation of iron ore deposits at Marcona (see *E&MJ*, December, page 175). On expiration of the government option —recently extended three months— Utah will automatically enter a 20-year contract to mine the deposits, estimated to be upwards of 100-million tons. Output will supply Peru's first steel plant, now being built at the

Headframe and concentrator of Bluebell Mine at Riondel, British Columbia



Since placed in operation at the Bluebell Mine in April, 1952, this 25" x 36" Telsmith has crushed about 95,000 tons in less than six months. Telsmith Jaw Crushers are made in 9 sizes: 10" x 16" to 30" x 42"; capacities: 22 to 300 tons per hour.

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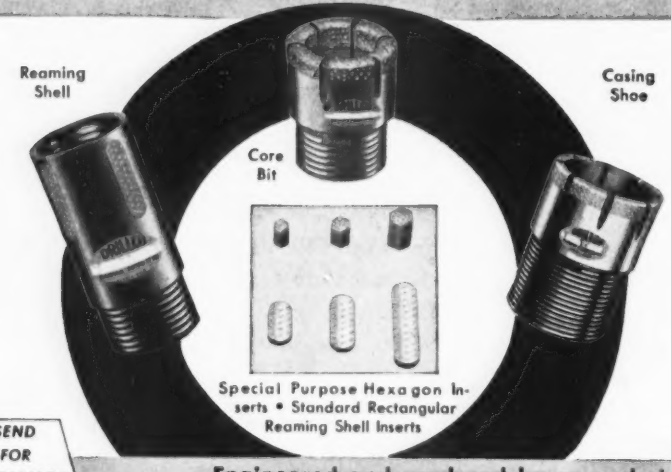

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Peru *(Continued)*

northern port of Chimbote, and be sufficient for export as well.

★**Cía. Minera Santo Toribio,** a new company, is operating in the Jecanca mining area of the Callejon de Huaylas region. Exploration is concentrated in the Santo Toribio vein, but the company is also exploring property formerly held by Cía. Minera Jecanca.

Lead-zinc ore is treated at a selective flotation plant near Huarez. Capacity at present is 80 metric tons of ore a day. Output is about 150 metric tons of lead concentrate and 300 metric tons of zinc concentrate a month. The management plans to build a similar plant in the Jecanca area in the current year.

VENEZUELA

★Current developments point up the possibility **a thriving iron and steel industry** will be established in Venezuela. News that **U. S. Steel's** Orinoco Mining Co. is exploring a promising new deposit in the area of the Conoma mines—as large and possibly as rich as Cerro Bolivar—and that the company will complete its $24-million dredging program this year was coupled with the announcement that the German firm, **Krupp-Technik, Fried-Krupp,** and Swiss associates are studying plans to set up a $90-million iron and steel industry.

The new iron-ore discovery, a hematite deposit, extends over 7,500 acres along the border of Anzoategui and Sucre states almost to the sea. The location is near the Naricual coal mines and provides ready access to Venezuela's second port city, Puerto La Cruz.

Orinoco Mining Co., which already completed dredging the Coroní river and waterways in the region of Puerto Ordaz, the new iron port, scheduled completion of dredging operations in the Orinoco and Macareo this year. The company is under contract to maintain these waterways for 50 years.

Krupp Engineer Fred Goetsch, who outlined the German company's project, said the only obstacle to it is the possibility that Venezuela's coal may not be suitable for production of various by-products that would be turned out—as the plan now stands—by a Swiss chemical company. In this connection, Mines Minister Luongo Cabello has sent 60 bags of coal to Germany for chemical analysis.

★A Venezuelan-North American **syndicate headed by Carlos Bousquet,** Caracas merchant, will invest $40-million to produce at least 36,000 tons of manganese ore a year, starting within two years, contingent on results of a six-month exploration program already under way. The property covers 11 concessions bought from **the Borges Rodriguez family** in

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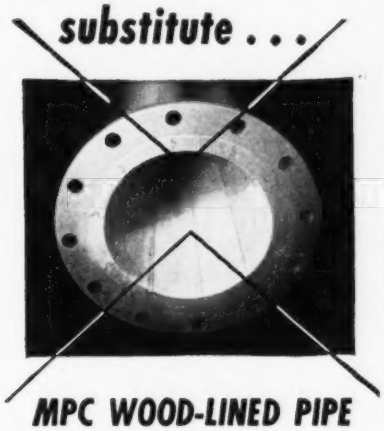

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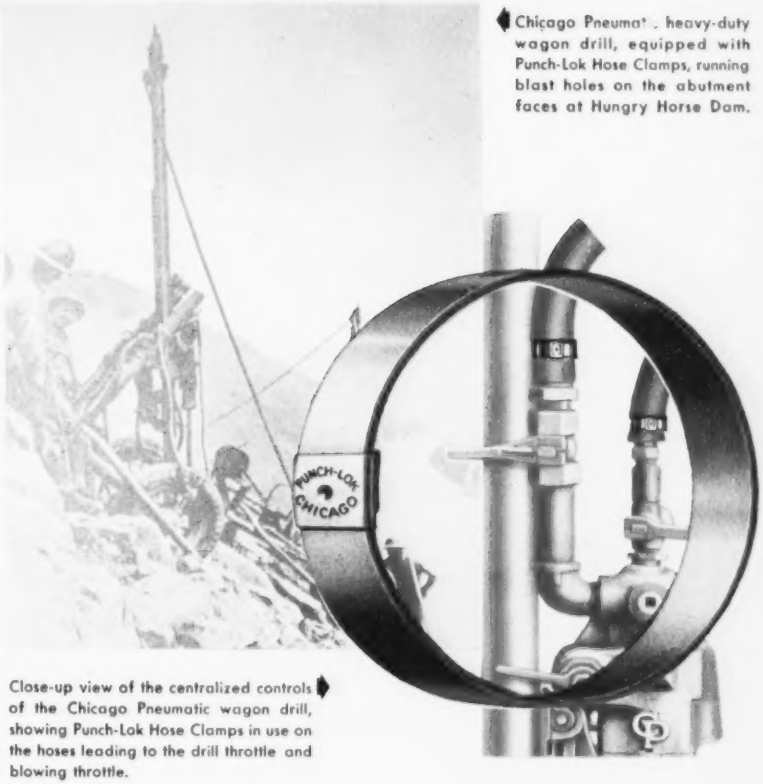

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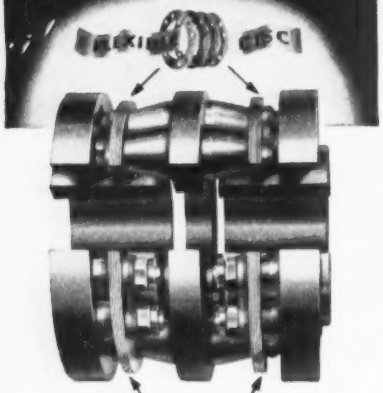

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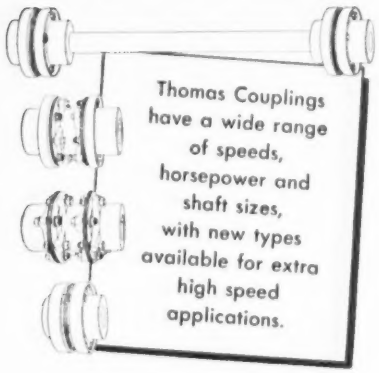

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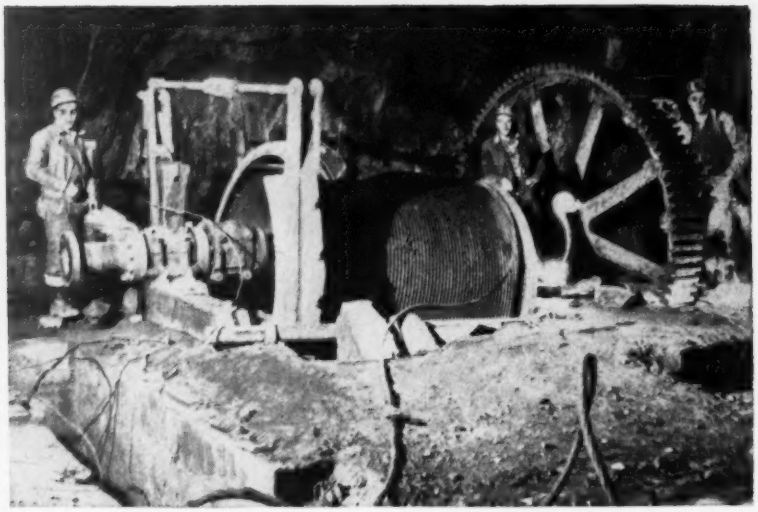


MULE AND CART carried this single-drum steam hoist through Bolivia's Kari Kari mountains to the 16,000-ft. elevation of Compañia Minera Andacaba's silver mine, 25 km. southeast of Potosi. The main shaft, about 8 in. in diameter, was transported in 12-in. segments, flanged so that they could be bolted together, and the bull gear and hoist drum also are bolted segments. Cement was unavailable when Andacaba's underground steam plant was installed, so the hoist was pinned down by bolts extending about 6 ft. through the hoistroom floor to drifts driven beneath it.

IN AFRICA

★ Mines, mill, and transportation and housing facilities of the projected Bancroft mining operation will require an initial outlay of about £11-million and take five years to put into operation, H. F. Oppenheimer declared at a recent stockholders meeting of the sponsoring company, **Rhokana Corp., Ltd.**

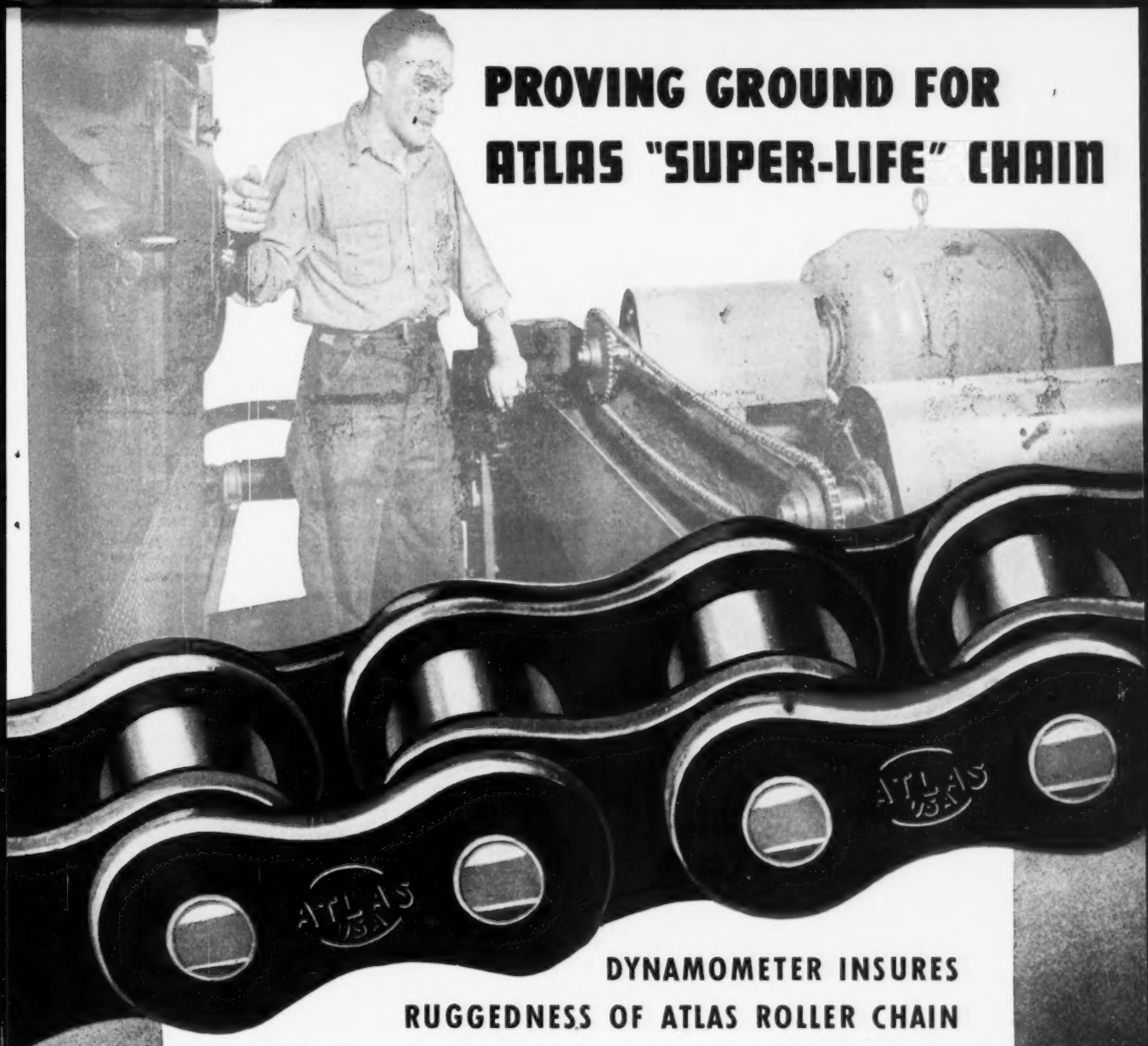
The site, near the Belgian Congo about 14 mi. northwest of property of South Africa's Nchanga Consolidated Copper Mines, Ltd., covers 56,848 acres in claims and includes three copper ore bodies: the Konkola, estimated to contain 32.9-million tons averaging 2.48% copper, and the Kirila Bomwe North and South orebodies, estimated to contain 46.7-million tons averaging 4.39%. Average grade for the total ore indicated was put at 3.6% copper. Ores are chiefly sulphides, but there is some oxide as well. Oppenheimer pointed out that, since the deepest drillings to date have revealed values well above the cutoff point, there is strong probability further exploration will turn up substantial additional tonnages of commercial grade ore in the future.

Kirila Bomwe North and South are about a mile apart and 4½ mi. from the Konkola orebody. Beyond the claimed land, the company holds prospecting rights covering an additional 6,140 acres to cover possible extensions of the presently established orebodies in depth.

The program calls for construction of a mill at Kirila with 150,000-ton-a-month capacity, a rail line from Konkola to Kirila and on 55 mi. farther to the company's Nkana smelter, a road network, power transmission facilities linking the new mines to the power grid (Northern Rhodesia Power Corp., Ltd.) that serves the copper belt, and a town to house 500 Europeans and 4,000 Africans.

Oppenheimer said it was now believed the Nkana smelter, incorporating improved techniques, could handle the planned 4,000-ton-a-month output of Bancroft mines without additions to plant facilities.

★ Hero's laurels were being heaped on Richard Simelane, a Swazi bossboy who saved the lives of 19 fellow South African workers trapped 4,500 ft. underground by a rock fall early Wednesday morning, Dec. 17, in Johannesburg's **City Deep gold mine.** Three men were killed in the fall, and mine officials had little hope any of the others would be brought out alive. By four o'clock Friday afternoon, when rescue teams had penetrated 150 ft. along the drive toward the trapped men, Richard emerged, followed by three others. He ate soup and received medical treatment, then led a rescue party back to the others through the 400-ft. tunnel by which he had escaped. He'd pioneered the escape route in utter darkness, guiding himself by putting up his hands to feel the air currents. Section Manager J. X. Harrington's comment: "The most fantastic story of courage and resource I have known in all my mining career."



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Pictured Skookum 7038 Slusher Block built to mining specifications. This block is perfect for slusher or slope mining because it was designed to its environment.

IN ASIA

★With a $50-million World Bank loan just about in the bag, Japan and India were swinging the focus of their efforts on plans for building **an iron mill in Orissa**, near Calcutta, India, to settlement of bilateral differences. Japan, for example, prefers to make its investment in kind, and the Yawata, Fuji, and Nippon Kokan companies—participating in the scheme—want to get iron ore, as well as pig iron, from the mill. India is anxious to bring in a cash investment and favors exporting chiefly pig iron. These issues may be resolved in the spring, when it's expected Indian representatives will confer with Tatsusosuke Takasaki, president of Electric Power Development Co.

IN AUSTRALIA

NEW SOUTH WALES

★**Gold** production continues to decline, and a reverse in the trend is not in sight.

Most **antimony** mines are down and shrouded in pessimism for the immediate future, but it is believed the removal of export controls will be beneficial to the industry in the long run.

Tungsten, lead, and copper production have fallen off slightly, but **cadmium** output is holding firm, and there's been a marked increase in tin production.

NORTHERN TERRITORY

★Business is lively in the scheelite fields here.

Western Wolfram, N. L., was readying for start of production early in the year.

Pioneer Scheelite, N. L., was obtaining increasingly better results as underground development proceeded and anticipated steadily increasing mine output—at least 10 tons of wolfram concentrates a month in the current year.

Doria Gold Mines, N. L., taking confidence from recoveries obtained with its Kurinally battery and the fact that the reef it's mining has been getting wider and richer with further development, planned to increase extraction to 100 tons a week. It was estimated that crushings being carried out at other points on the property graded 4%.

Territory Scheelite, N. L., was pushing further development in the hope the Doria lodes extend into the former company's lease.

★**Peko Gold Mines** was seeking £250,000 for further development, planning to acquire Fluosolids roasting facilities and turn out 100 tons of copper and gold ores a day. Development at the 300-ft. level indicated high magnitude and good value.

TASMANIA

★**King Island Scheelite's** goal for 1953 is to overcome delay in its program to expand mill output of 4,000 tons a week, attributed to inadequacy of shipping equipment, and attain a 5,000-ton-a-week average.

★Despite inroads made in ore production during the past year by the emphasis given removal of overburden, **Mount Lyell Mining Co., Ltd.'s** income from blister copper was increased to more than £3-million (Australian) up nearly 50%. By removing 30-million tons of overburden, the company estimates it could extend its reserve by more than 50%, improve average grade, and within a few years increase annual copper output to more than 10,000 tons.

VICTORIA

★Gold producers were reporting good news.

Morning Star, working better-grade ores (up from 16.4 to 23.0 dwt. a ton) reported it was getting the best yield in many months, estimated its reserve at 60,000 tons of ore averaging 14 dwt. a ton.

Harrietville (Tronoh) Ltd., has just finished dredging through all its barren tailings and is looking forward to several years of profitable dredging.

Al Consolidated Gold, N. L., was able to embark—upon installation of its modern new 20-head battery—on a program of greatly expanded output, including treatment of lower-grade ores. Shaft sinking was scheduled for resumption early in the year, and the company proposed to diamond-drill for payable reefs that may have been bypassed in upper workings. The company's reserve was estimated at 15,000 tons averaging 12 dwt. a ton.

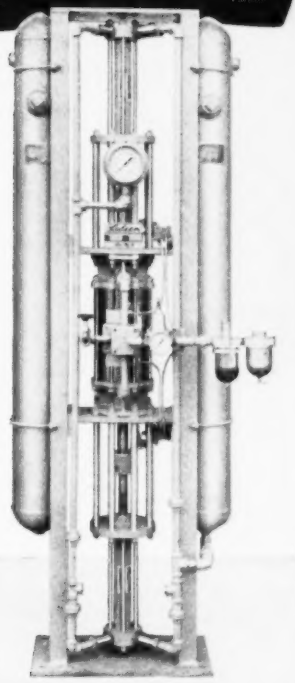
Cocks Eldorado Gold Dredging, N. L., whose 1952 yield was 2,825 oz. of gold and 47.5 tons of tin concentrates, was getting better results, attributable to technical improvements and high value of the area being dredged.

★**Victorian Antimony Mines, Ltd.'s** plant for treatment of antimony, now being put through test runs, may go into commercial operation in April.

★The new **Snowy Mountains Mines, Ltd.**, was planning to put the Bendoc Wolfram-bismuth mine into production in April and was expected to get 2% recovery.

★**North Deborah Mining Co.** recently curtailed its development program, and the future looked bleak for **Maude and Yellow Girl Mining Co.**

Ledeen PUMPS



HIGH PRESSURE OIL from LOW PRESSURE AIR

Ledeen Heavy Duty Pumps and Power Units are built for operation of clamps, valve actuators, forming or drawing presses, safety installations, high pressure testing and other hydraulic circuits requiring adjustable pressure and volume and long pressure-holding cycles, without overheating the oil. Built as a complete package power unit, ready for easy installation, requiring connections only to incoming air line and outgoing hydraulic lines. Available in horizontal construction for minimum head room, and vertical construction for minimum floor space. Simple to install. Inexpensive to operate.

Write for Bulletin 4000

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VALVE ACTUATORS • AIR HOISTS

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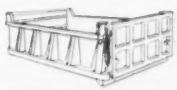
NEW HOIST RATINGS prove St.Paul best!

Tear out this ad . . . use it to compare St.Paul's "bonus capacities" with any other hoist. You'll find St.Paul gives you *far more payload capacity per lb. of weight — at all body lengths!* Your truck dealer, or St.Paul distributor will also show you why St.Paul's advanced mechanical and hydraulic improvements mean *lower installation costs, added hours of smooth, trouble-free performance.* Get the complete story on these great new St.Paul dump body hoists today, or write for free illustrated folder. St.Paul Hydraulic Hoist, Customer Service Dept., 36121 Main St., Wayne, Michigan.

St.Paul Hoist Ratings

Model	Wt. lbs.	Payload tons at body lengths shown									
		7'	8'	9'	10'	11'	12'	13'	14'	15'	16'
D-16	550	7	6								
H-16	650		9								
H-18	735			8	7	6					
H-20	795			10	9	8	7				
L-20	870			12½	11	10	9	8			
L-24	1020				12	11	10	9	8		
2 H 20	1370				17½	15½	14	13	12	11	10
2 L 20	1555				22½	20	18	16	15	14	13
2 L 24	1695				27½	24½	22	20	18	17	16

...also check St.Paul's complete new line of matching dump bodies



MODEL 301 Triple-strength contractor's body with pyramid side braces and boxed corner posts.

MODEL 106 Drop-side body with hinged sides and tail gate for easy hand loading with shovel.

MODEL 103 Combination dump and platform body with removable sides and corner posts.

MODEL 311 Heavy-duty rock-type body with scoop end for easy dumping of bulky loads.

OUR 41ST YEAR

S-HBC-7

St. Paul HYDRAULIC

Hoists and Dump Bodies
Pax-all Refuse Loaders
Elevating Front Gates

oldest in reputation . . . *newest* in cost-saving features

Smooth Starts
mean low operating costs

WHEN a rear-dump truck pulls away smoothly from a shovel with a 30-ton pay load — without jolts and jerks — it's sure to stay on the job longer with less down time.

Trucks equipped with Allison TORQMATIC converters and transmissions always start smoothly — because TORQMATIC DRIVES absorb these shocks instead of transmitting them to other truck parts.

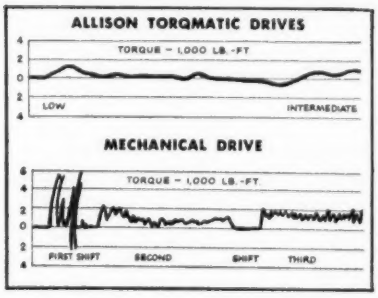
To demonstrate this, Allison engineers measured power-train shock loads in a large number of earth-moving, coal and ore-hauling trucks under both normal and extreme operating conditions. These charts show the results.

Trucks equipped with Allison TORQMATIC DRIVES showed starting shock loads four times less severe than trucks using mechanical drives. Furthermore, trucks equipped with Allison TORQMATIC DRIVES were *quick-shifted* at full throttle.

If you're operating off-highway trucks or other heavy-duty earth-moving equipment, specify Allison TORQMATIC DRIVES, the matched team of torque converter and hydraulic transmission. Ask your dealer, equipment or engine manufacturer for further information or write to:

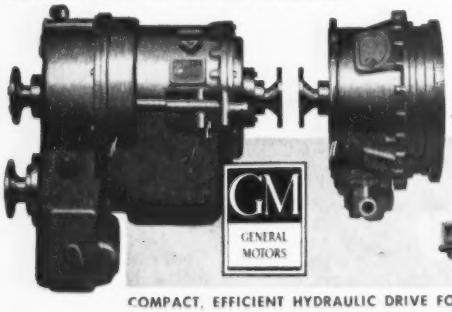
ALLISON *Division of* GENERAL MOTORS
Box 894MM, Indianapolis 6, Indiana

POWER-TRAIN SHOCK LOADS



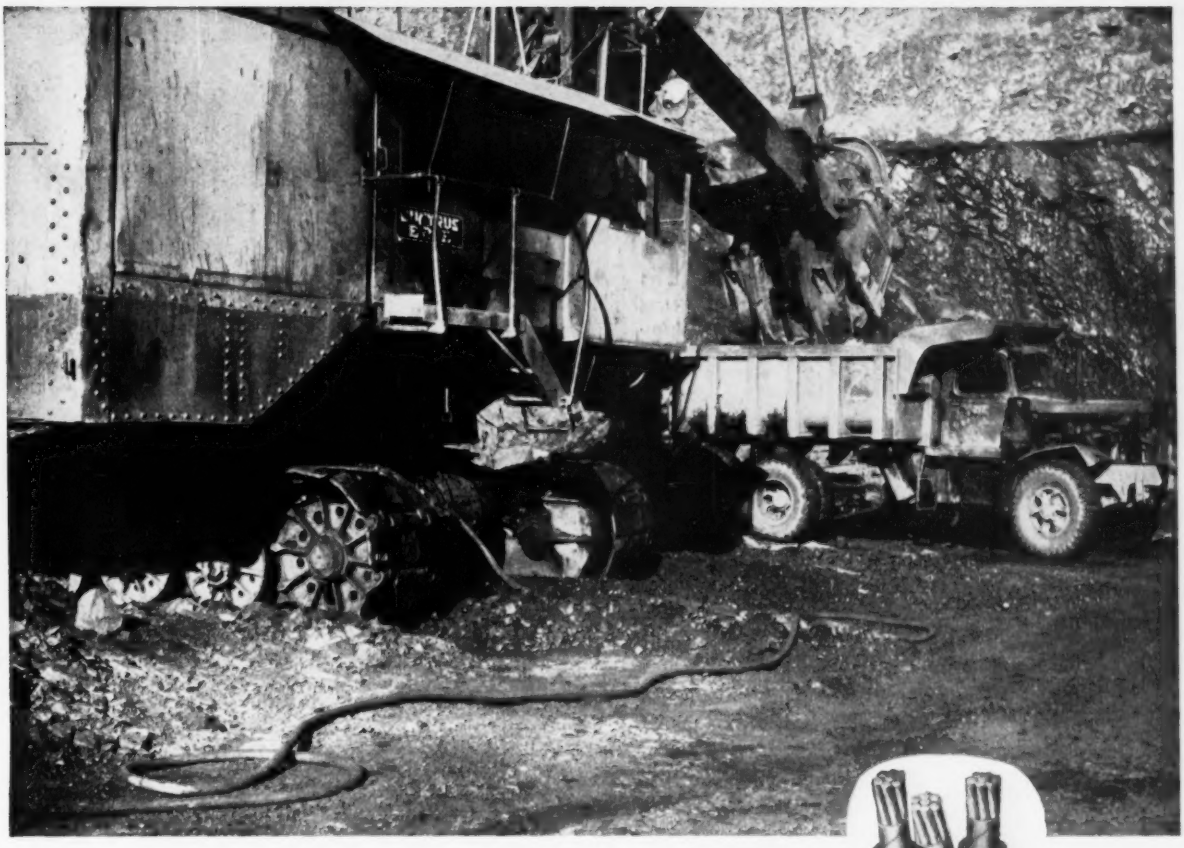
Note the jagged line — shock loads — as the mechanical drive truck pulls away from the shovel and shifts from first to second gear. Compare the smooth line — no harmful shock loads — for the truck equipped with Allison TORQMATIC DRIVES.

MATCHED UNITS BUILT BY ONE MANUFACTURER



Allison TORQMATIC DRIVES

COMPACT, EFFICIENT HYDRAULIC DRIVE FOR TRUCKS * CRANES * TRACTORS * SHOVELS * DRILLING RIGS * SCRAPERS



proved in the toughest service...
HAZACORD shovel cables

These cables can take it—they have to, for backing up the big shovels is as punishing as any job a cable is called upon to perform. Continuous dragging over sharp rock, exposure to all kinds of weather, tortuous flexing, coiling — it's all in a day's work for shovel cables.

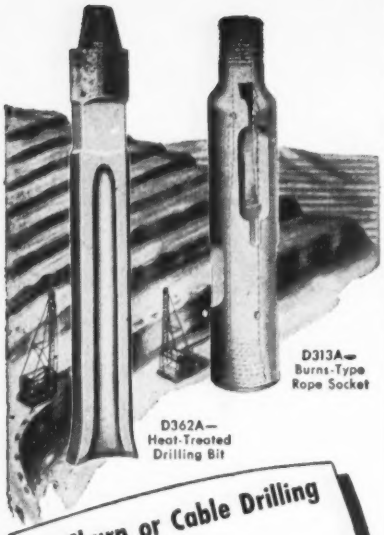
Among the six types of Hazacord shovel cables you'll find the one that best meets the requirements of your particular operation. Take, for instance, Type SH-D: Over each insulated conductor you'll find a copper shielding braid; properly grounded, it equalizes surface stresses and drains off all capacity charging currents to assure safe handling. In addition, the three grounding conductors provide an adequate low resistance ground for the equipment. Like all Hazacord shovel cables, Type SH-D has the protection of the tough Hazaprene ZBF Sheath—a mold-cured, double layer of Hazaprene for added resistance to abrasion, wear and tear. Recommended for use up to 15,000 volts, Type SH-D is the safest, most used design for high-voltage applications.

For full information on Hazacord's many features that are delivering money-saving service to more and more operators . . . for performance characteristics and specifications of each of the six Hazacord shovel cables, ask your Hazard representative or write Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pennsylvania.

Hazard Type SH-D Shovel Cable

Embossed:
HAZAPRENE ZBF P-104BM

HAZARD insulated wires and cables for every mining use



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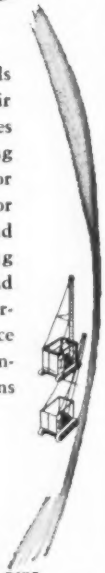
• PROSPECT HOLES
• SAMPLING

SAFE • EFFICIENT • ECONOMICAL

Spang Churn or Cable Tools are top performers in their fields for drilling test holes when prospecting or sampling . . . drilling blast holes for fragmentation of minerals or overburden . . . drilling and reaming escape, dewatering and ventilating holes . . . and drilling wells for other purposes. Fifty years' experience serving oil, water-well, mining and quarrying operations assures their value.



D606—Reamer-Type Pilot Bit

LARGE BITS for pilot hole drilling and stage enlargement reaming of dewatering, ventilation and escape holes.

D370F—Prefabricated Star Bit

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made by
SPANG & CO., BUTLER, PA.
for
• SHOT BLAST HOLES • WELL DRILLING
• PROSPECT DRILLING • SAMPLING

Silver

(*Continued from page 77*)

silver, the Treasury would have to issue about $292-million in silver certificates to buy the silver from the State Department, successor to Lend-Lease Administration. About 226-million oz. of the silver would go into the "Silver" account to back up the certificates, and about 184-million oz. of the lend-lease silver would return to the free silver account from whence it came.

It is possible, however, that the Treasury could get this silver back as "Surplus Property" without paying State for it. It would then show on the Treasurer's books as bullion with zero cost value and could be used for coinage. State would have to approve this idea, of course. Alternatively, Treasury could buy all the lend-lease silver under authority of 31 USC 335 (1853 Stat.)

One way or another, the efforts of the Treasury to satisfy the demand for silver coins in the future will be interesting to watch.

This Month in Mining (*Continued*)

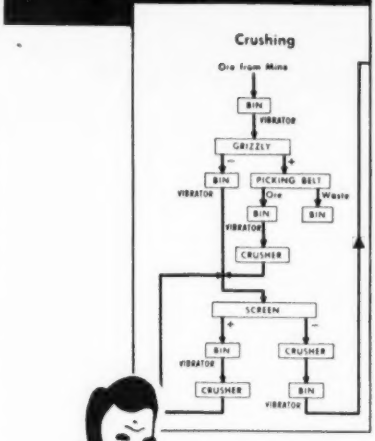
NEWFOUNDLAND

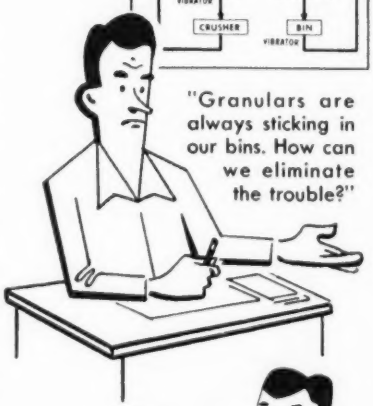
★Underground development is being started at the York Harbor property of **Independent Mining Corp.** A series of small but high-grade copper lenses have been outlined by drilling, and these will be opened first by a 2,000-ft. adit, above which there will be 400 ft. of backs. To aid the project, the Newfoundland Government is building a 14-mi. road to the property.

★**Premier Joseph Smallwood** of Newfoundland has urged the formation of a new British company, made up of a number of existing companies, to develop the resources of Newfoundland —and more particularly of Labrador. He said that the actual development of resources believed to exist in Labrador must necessarily be preceded by a "prospective or exploratory period." Among the minerals known to exist, he said, were vast quantities of iron ore and manganese, and, there was every reason to suppose titanium, copper, lead and zinc. There were unlimited quantities of high grade timber and a greater hydroelectric potential than was at present develcped in all Canada.

★A depth of more than 300 ft. has been reached by **New Mosher Longlac Mines** in shaft-sinking. Designed to explore the expected westerly rake of MacLeod-Cockshutt's "F" zone at depth, the program is a long-term project, with the first level to be established for drilling purposes at 1,700 ft.

BIN STUCK LATELY?





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VIBRATOR

Literature on request.

THE CLEVELAND VIBRATOR COMPANY
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Use these "Agents"

FOR BEST RECOVERIES

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HERCULES YARMOR® F PINE OIL
Standard of quality among pine oil frothers since the early days of flotation. Yarmor F Pine Oil produces a strong froth of good volume, satisfactory texture, and excellent cell-life stability.

Collectors

RADA (Hercules Rosin Amine D Acetate)
Siliceous mineral collector that has good solubility and handles easily.

Rosin Amine Derivatives: Special purpose collectors; uses vary with type of materials to be floated.

Technical information on these and other flotation aids is available.
Send for 16-page booklet "Flotation and Hercules Flotation Agents."

HERCULES Flotation Agents

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NM52-1

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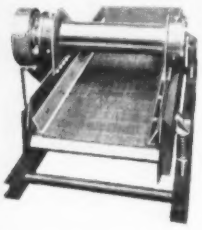
round rod screens

Frozen coal in cars is not a necessary evil in your business. It can be prevented — definitely. How? It's simple. By a better job of dewatering with BEE-ZEE Round Rod Screens. It stands to reason that a curved surface like this O will drain off water quicker, more efficiently than any other type. This exclusive BEE-ZEE feature alone will make you money.

HANDLES ANY SCREENING JOB



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BEE-ZEE SCREENS CAN BE FITTED TO ANY SCREENING EQUIPMENT

Tin (*Continued from page 85*)

"Our reserves are no longer at the dangerously low levels that they were a year and a half ago. . . . The forces of supply and demand with regard to tin are more nearly in balance at the present time than they were. I believe they will come into even better balance with the resumption of private importing."

A revolution in Bolivia, April 8-11, 1952, after heavy loss of life, resulted in the victory of the MNR group led by Dr. V. P. Estenssoro, who had been elected President, in absentia, in 1951 but who had been prevented from taking office by an interventing military coup d'etat. In September, the new government announced that it had decided to nationalize Bolivia's three major tin-mining companies, namely the Patino, Hochschild and Aramayo groups of mines. This step was formalized by government decree on Oct. 31.

The government proposes as payment for these properties a total of $21 million (the three concerns are said to have placed a valuation of $60 million on them), but lists against such proposed payment a "bill' for $520 million, on the charge that the companies made illegal profits through exchange manipulations and evasion of income taxes.

At the same time the Bolivian Government announced that it had signed an agreement with an Argentine financial group for the construction of a smelter in Bolivia to produce 99.9% tin metal. (It would, of course, require several years to bring such a plant into production.)

For the U. S. this action has serious implications. The prospect now is not only for a dwindling of Bolivian supplies but further, in the event that Bolivia does erect its own smelter, the eventual removal altogether of Bolivia as a source of supply for the Longhorn smelter in the U. S.

In September the United States purchased from Banco Minero de Bolivia the pre-nationalization production of Bolivian concentrates which could be delivered by Nov. 30. This was believed equivalent to 6,000-7,000 tons of tin.

On Dec. 30, the NPA announced that allocation controls on pig tin would end as of Jan. 1, 1953, and authorized increased use of tin in various non-essential products. The NPA emphasized that industrial users are still restricted to 90% of their pre-Korean consumption of pig tin, and that restrictions on use of tin in alloys, plating, and solder are still in effect.

Statistical data for the years 1951 and 1952 are shown in accompanying Tables I-V, together with corresponding data for the pre-War period 1936-1939 in an effort to convey some idea of the changed and changing pattern of the world tin industry.

Attention is called particularly to Table V which, in view of Mr. Larson's remarks as to our reserves of tin, assumes importance. It is probable that at the close of 1952 U. S. stocks, government and private together, were about double the stocks with which we entered World War II. It may well be, therefore, that government authorities do now in fact believe that "reserves are no longer at dangerously low levels."

If government controls are now to be relaxed or, better yet, removed altogether, it will be interesting to observe the response of the consuming industry to the prospect of unrestricted supply. Before World War II the industrial use of tin in the U. S. fluctuated in close correlation with the FRB index of general industrial activity. Since the end of 1941, however, U. S. tin consumers have been unrestricted as to use for only 14 months (Nov., 1949, to Jan., 1951), and the curve of the use of tin has lagged far behind that of other nonferrous metals during the postwar boom. Prolonged government controls on consumption have had the effect of compelling the use of substitute materials and giving them a degree of permanence among consuming industries. People have gotten used to them. Only over a considerable period of unrestricted availability and use can tin's future proportionate share of the nonferrous metals market in the United States be accurately determined.

Perlite

(*Continued from page 109*)

were found for very fine perlite, essentially minus-100-mesh, as a filter aid, and in paints. Various grades of perlite proved to have good applications in the foundry industry where it is used to insulate risers and as an additive to core and facing sands.

GM DIESEL
CASE HISTORY No. 526-25

USER: Aurora Limestone Products Co., Aurora, Iowa, producers of road stone and agricultural lime.

INSTALLATION: GM 3-71 Diesel powers a ¾ yd. Unit shovel, replacing a ¾ yd. shovel powered by a gasoline engine.

PERFORMANCE: GM Diesel powered shovel works faster, feeding crusher about 17% more per day. Fuel consumption averages 4 gallons per hour, saving 33% on operating costs.

THIS DIESEL LOADS FASTER

and costs 1/3 less to operate

A few days after Aurora put this shovel to work, they rented a 2-cycle General Motors 6-110 Diesel for their portable crusher while the old 4-cycle Diesel was in for overhaul. Production increased from 680 tons per day to 800 tons. Fuel costs dropped from $14.00 per 10-hour day to $9.80. Needless to say, the 6-110 now powers the crusher. With power on every piston downstroke, fast accelerating GM Diesels enable equipment to do more work each day. They're quick starting—easy to service and cost less to maintain. That's why users tell us "any machine with GM Diesel power is a better machine." Specify GM Diesels for your equipment.

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SINGLE ENGINES 32 to 275 H.P. MULTIPLE UNITS Up to 840 H.P.

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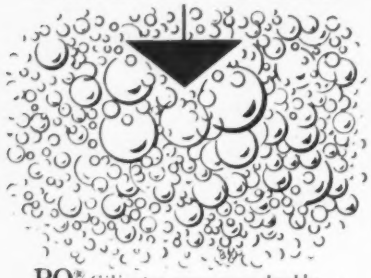
Write for booklet, "A 50,000,000 Horsepower Investment Policy," that tells you why.

Catch more in the froth



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→ Efficient cleaner for slimes

PQ® Silicates help you obtain higher recoveries from sulfide ores, oxidized ores, ores of non-metals, alkaline earth ores.

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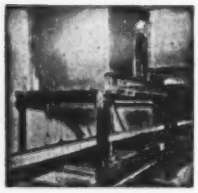
PQ **PQ Silicates of Soda**
METSO DETERGENTS

WEIGH WITHOUT STOPPING

WHILE YOU **CONVEY**



Yes, weigh and record with the —MERRICK

WEIGHTOMETER

The Merrick Weightometer provides a continuous, automatic, accurate weight record at any designated point in the mill, while material is in motion on conveyor. It weighs without interrupting conveyor service.

Applicable to any size belt conveyor, horizontal or inclined. An accurate and dependable means of keeping constant check on production.

MERRICK SCALE MFG. CO PASSAIC N. J.

Perlite *(Continued)*

Perlite was used in the oil well drilling industry as an additive to cement slurries in setting casing or cementing off. The function of perlite is to reduce the density of the slurry which in turn reduces pump pressures. Perlite also results in a less brittle concrete permitting easier and better perforating. During the year perlite began to find greater application as an additive to drilling muds to help solve lost circulation problems and one large supplier of drilling muds has now added a perlite to its line of products.

Some interest was shown in perlite as an industrial oil absorbent and as a soil conditioner.

During the year one of the major gypsum companies put a pre-mixed perlite-gypsum plaster on the market and seriously entered into the production of perlite for its own use. This company also began mixing perlite with gypsum in its gypsum roof deck applications and are marketing a pre-mix for this field. This company is now vigorously promoting its new products in the plaster and roof deck market.

The accompanying map is presented through courtesy of the Perlite Institute showing the geographical distribution of its members.

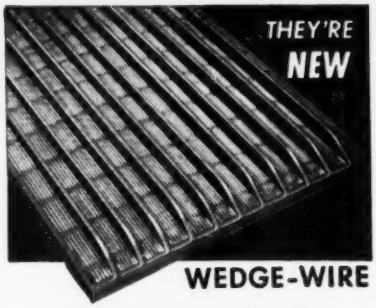
The perlite industry should continue to grow in 1953 but the rate of growth is expected to taper off. More effort will be spent to develop new markets for this versatile material and the coming year should see interesting new developments.

Barite

(Continued from page 109)

52,755 tons. Principal countries of origin were Canada, Yugoslavia and Mexico. With the exception of Mexico, most of this foreign ore came in through Atlantic and Gulf Coast ports and found its way into the well-drilling and chemical industries.

World Production. The total world production of barite in 1952 is estimated at 1,900,000 short tons. The United States accounts for almost half of this tonnage. The balance originates principally in Germany, Great Britain, Canada, Italy, Greece, Yugoslavia, Peru and Algeria.



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SCREEN GUARDS
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LONGER LIFE! Particularly adaptable for use at the discharge end of flumes. The guard is built right into the screen to keep the larger lumps of material above the guard bars permitting only the finer particles to pass over the screen. Precision made.

ECONOMY!! They are non-clogging, non-blinding, strong, rigid, uniform and consequently more economical in the long run.

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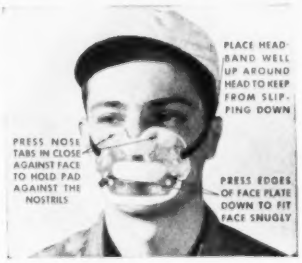
PROTECTIVE MASKS


PLACE HEAD-BAND WELL UP AROUND HEAD TO KEEP FROM SLIPPING DOWN
PRESS NOSE TABS IN CLOSE AGAINST FACE TO HOLD PAD AGAINST THE NOSTRILS
PRESS EDGES OF FACE PLATE DOWN TO FIT FACE SNUGLY

Weigh Less than ½ ounce.

Clean, cool, comfortable. Excellent protection against non-toxic dusts except free silica. Replaceable cotton pads are inexpensive and sanitary.

Martindale Protective Masks .....$.30 ea.
No. 1 Refills (Standard weight) ..... .02 ea.
No. 2 Refills (heavyweight) ..... .02½ ea.

Masks packed individually. Refills packed 25 to envelope. No. 2 (heavyweight) Refills contain twice as much filtering cotton as No. 1.

DISCOUNTS

Less than $10.00 list ....Net
$10.00 to $24.99 list 10%
$25.00 to $99.99 list 15%
$100.00 and over 20%
Minimum, charge account or C.O.D. $2.00
Minimum, cash with order $1.00

If payment accompanies order we will pay parcel post or express charges.

MARTINDALE ELECTRIC CO.
1378 Hird Ave. Cleveland 7, Ohio

CONNELLSVILLE
(LEPLEY)
Safe MINING EQUIPMENT

Economical-Rugged!

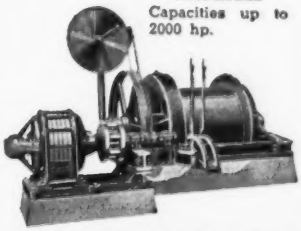
MAN CAGES
Single or double deck types. Capacities from 1 to 90 men.

BOTTOM DISCHARGE SKIPS
Built to "take it" in 1 to 25 ton capacities.

SKIP LOADING CHUTES
Operated either by skips or air cylinders. Toggle locked when closed.

SHEAVES
Bicycle type with renewable special steel liners. Up to 16 ft. dia. with plain or anti-friction bearings.

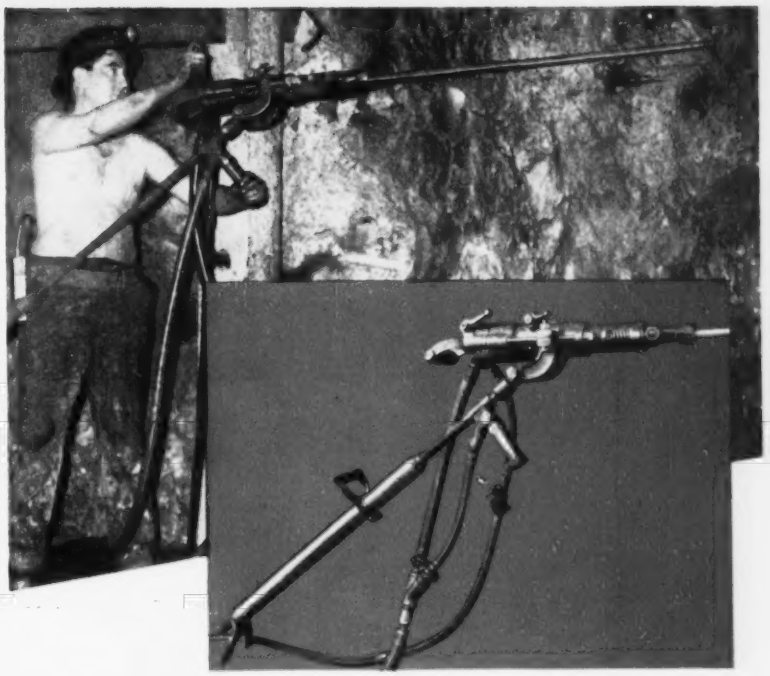
ELECTRIC HAULAGES
Capacities up to 2000 hp.



WRITE FOR COMPLETE DETAILS

We specialize in all types of equipment to meet your needs

CONNELLSVILLE
MFG. & MINE SUPPLY CO.
CONNELLSVILLE, PA.
"Serving the Mining Industry Since 1901"



YOU MUST SEE IT TO BELIEVE IT

*Five out of six mine operators buy *COPCO rock drilling equipment when they see it demonstrated.*

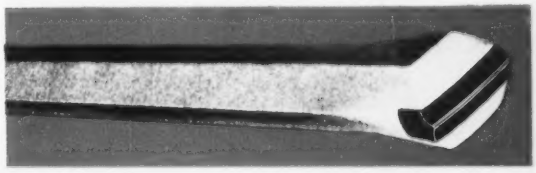
When one man can outdrill two, it's no wonder so many operators are changing over. Every western mining town is buzzing with talk about this new Swedish rock drilling method.

The ***COPCO COMBINATION** is light in weight, but it's rugged and powerful. One miner can set up and drill out easier and faster than two men can use conventional equipment.

***COPCO ROCK DRILLING EQUIPMENT**

Atlas Rock Drill — Light, tough, and hard hitting, it sets up quickly and simply on the Atlas pusher leg.

Sandvik Coromant Steel — Swedish alloy steel rod with an integral tungsten carbide bit, it cuts 50 to 200 feet of hard rock before resharpening.



WRITE FOR FREE DEMONSTRATION AT YOUR PROPERTY

(Presently demonstrations are limited to the western states)

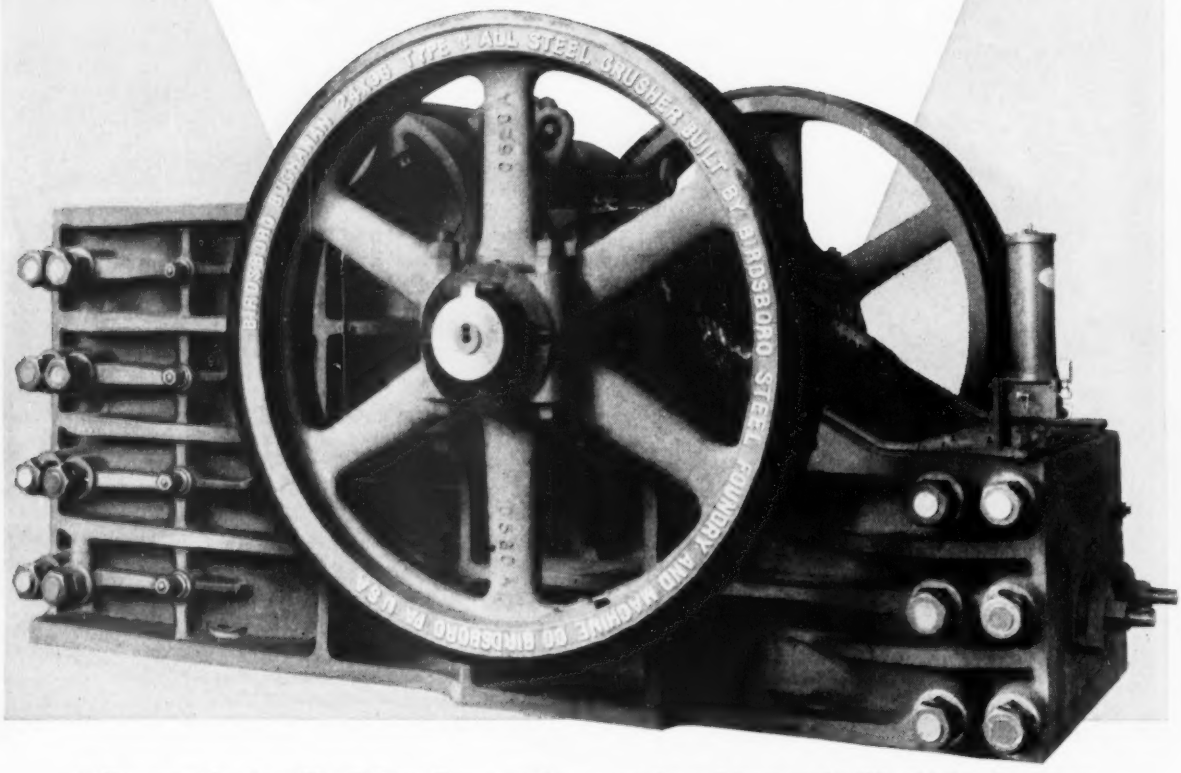
COPCO PACIFIC, LTD.
930 BRITTAN AVENUE, SAN CARLOS, CALIFORNIA

BRANCH OFFICES AND WAREHOUSES AT SPOKANE, SALT LAKE CITY, DENVER AND PHOENIX.

dependable
low cost crushing

BIRDSBORO-*Buchanan*

DEEP FRAME CRUSHERS



• For example, the 24"x 36" Deep Frame crusher shown here is the *third* Birdsboro - Buchanan Crusher of this size to be put into operation by *one* company.

These *all-steel* patented crushers are built for high capacity and long service life with heavier frames, longer jaws, bowed type interchangeable jaw plates and renewable end toggles. Available in sizes up to 66"x84", you'll find Birdsboro-Buchanan crushers meet most primary crushing requirements. Drop us a line for more details.

BIRDSBORO

STEEL FOUNDRY & MACHINE CO.
Birdsboro, Penna.

BIRDSBORO BUCHANAN JAW CRUSHERS

Designers and Builders of:
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Hydraulic Presses • Special Machinery • Steel Castings

World-Wide Agent Representation.

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Cr 1-53

an ACCO product

The BRAND is mighty important

● This HAZARD brand on wire rope got started in 1846. It's a top brand today not because it goes back 106 years but because Hazard wire rope has kept on improving.

Hazard research and engineering has built more hours of useful work into ropes that carry this brand name. It has experimented with metals and alloys and every known lay. It is working harder than ever today improving the ropes that bear its name.

Hazard's especially proud of its LAY-SET Preformed WIRE ROPE. You can tell it by the green strand. It lasts longer and costs less to use.

ACCO

HAZARD WIRE ROPE DIVISION
AMERICAN CHAIN & CABLE

TRADE MARK

Wilkes-Barre, Pa., Chicago, Denver, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

makers of ACCO Registered WIRE ROPE SLINGS

USED TO DESTRUCTION...NO RESHARPENING

Liddicoat

. . . the bit that drills farther, faster, for less

Liddicoat detachable bits are used to destruction and then discarded. The strong connection — no threads — provides good steel life and makes the changing of bits quick and easy. No delays, no resharpening, no extra costs.

With Liddicoat's low initial cost, you obtain lowest cost per foot of hole drilled.

Liddicoat bits actually chip out the rock instead of battering it until pulverized as is the case with ordinary conventional bits. The two-stage cutting portions for the life of the bit are the principal reasons for this stand-out performance of Liddicoat. The cutting edges are shaped for drilling speed and the reaming edges for long use.

Many of the world's most important mining and contracting companies have turned to Liddicoat for superior performance. Join this ever-expanding list of satisfied Liddicoat customers.

PILOT CONSTRUCTION

Section "AA", along the high-centre wings. Section "BB", along the low-centre wings.

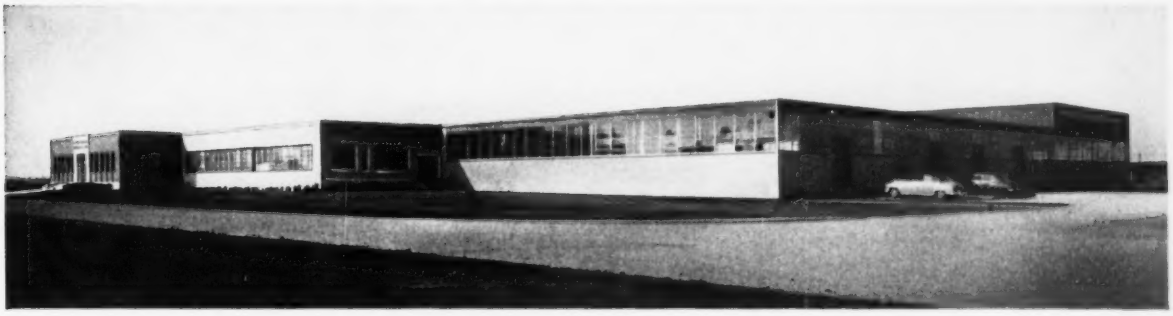
WESTERN
Rock Bit Manufacturing Company

552 West 7th South • Salt Lake City 4, Utah

EVERY LITTLE BIT COUNTS

GOULD OPENS 21ST PLANT

TO MEET INDUSTRIAL BATTERY DEMAND



Front and side views of Gould's new Kankakee, Ill., plant

GOULD'S NEW KANKAKEE PLANT which went into production on November 10 is the 21st Gould plant in the United States and Canada. Devoted entirely to the manufacture of storage batteries for industry, it gives Gould the additional capacity necessary to meet the increased demand for Gould batteries in all parts of the country. Thanks to these new facilities, Gould customers can expect even faster service than before.

GOULD *Industrial Batteries*

GOULD-NATIONAL BATTERIES, INC., TRENTON 7, N. J.

Always Use Gould-National Automobile and Truck Batteries

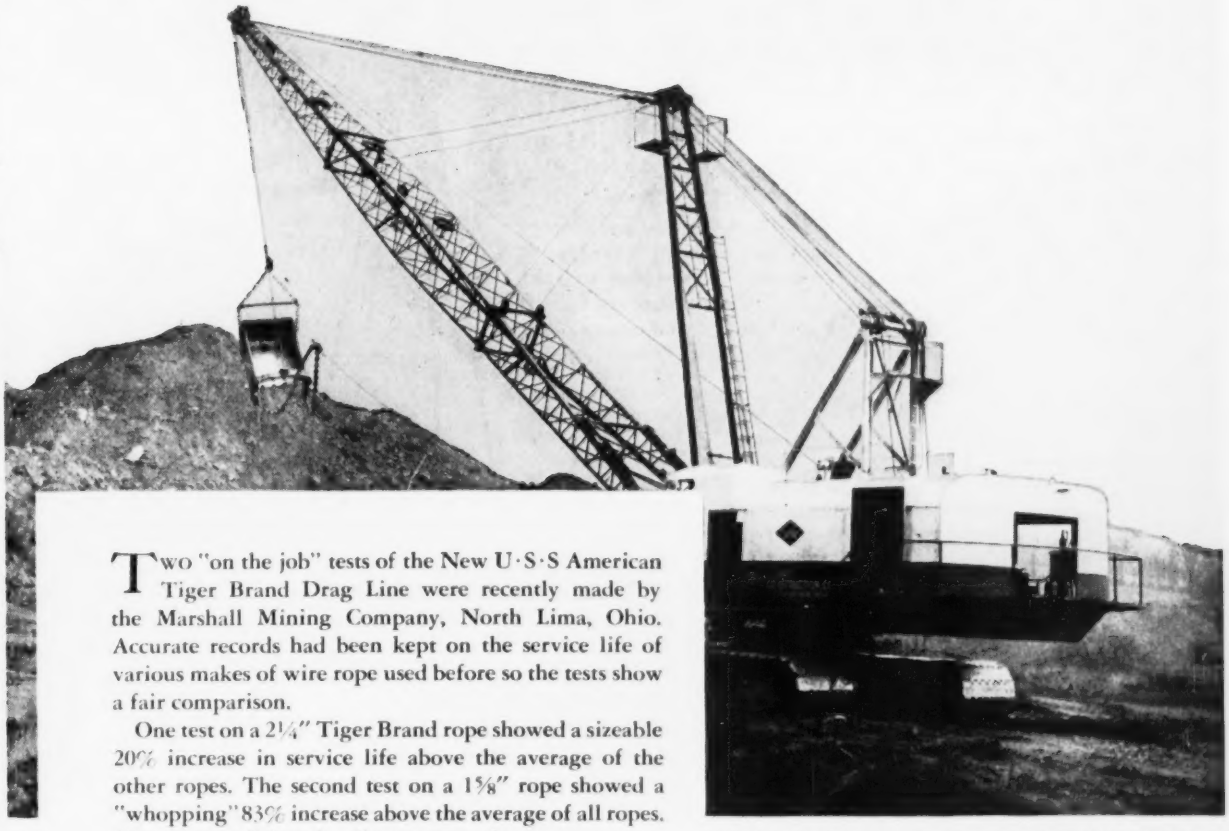
New American Tiger gives 20% to 83%

20% INCREASE IN WIRE ROPE LIFE. When this 14 cu. yd. drag line was equipped with the new Tiger Brand 2¼" Drag Line, the average service life of the rope was increased 20% over other brands tested.

SAVES MONEY AND TIME—INCREASES PRODUCTION. This new Tiger Brand Drag Line Rope quickly pays for itself through increased life and greater production. Try it next time you have to replace your drag rope.

USS
AMERICAN
TIGER BRAND
WIRE ROPE
UNITED STATES STEEL

Brand Drag Line increase in service life



Two "on the job" tests of the New U·S·S American Tiger Brand Drag Line were recently made by the Marshall Mining Company, North Lima, Ohio. Accurate records had been kept on the service life of various makes of wire rope used before so the tests show a fair comparison.

One test on a 2¼" Tiger Brand rope showed a sizeable 20% increase in service life above the average of the other ropes. The second test on a 1⅝" rope showed a "whopping" 83% increase above the average of all ropes. Digging conditions in all cases were the same.

This new Tiger Brand Drag Line was designed especially to resist the severe operating conditions imposed by this class of service.

The use of this new rope on your drag line will mean substantial savings in your wire rope costs. It will cut your down time and help to keep machines at top capacity.

DRAG LINE LIFE INCREASED FROM 600 HOURS TO 1100 HOURS—83%. The best service on this drag line using 1⅝" rope averaged 600 hours for other brands of rope. But with the new U·S·S Tiger Brand Rope, service life jumped to 1100 hours—almost double the previous average.

U·S·S AMERICAN TIGER BRAND WIRE ROPE

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL CORPORATION, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO · TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Excellay Preformed

UNITED STATES STEEL

PRECISION-MADE...PERFORMANCE-ENGINEERED ...SERVICE-PROVED

MIDVALE FORGED STEEL SHAFTS SERVE INDUSTRY ACROSS THE NATION

Whether it is mammoth shafts for turbines or generators, or extra heavy shafts of any description, Midvale craftsmanship means top performance. Industry after industry, from coast to coast, has learned to rely on Midvale when specifications are exacting and the job is big.

Whatever your needs for heavy custom-built equipment—whether shafts, rolls, pressure vessels, or any other type of forging—Midvale is your guarantee of precision and performance. For at Midvale, modern equipment and quality control are combined with years of skill and experience to produce the finest, most dependable heavy steel forgings industry can produce.

When heavy forgings must meet rigid specification, rely on Midvale precision craftsmanship.

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MIDVALE
Custom Steel Makers to Industry
PRODUCERS OF FORGINGS, ROLLS, RINGS, CORROSION AND HEAT RESISTING CASTINGS

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plastic protective equipment

keep on the safe side

wear WILLSON MONOGOGGLES®

Workers wear Willson protective equipment willingly because these MonoGoggles® and other safety devices shown are lightweight and comfortable. MonoGoggles® illustrated above are available in flexible *Polythene* and fully transparent *Acetate* for extra side vision. Interchangeable lenses in clear plastic or Tru-Hue green. Ask for Willson—the leading line of respiratory and eye safety equipment for industry, farm and home use.

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WILLSON PROTECTO-SHIELD®

gives full face protection with a choice of 4", 6" and 8" visors. Ideal for many industrial operations. Also available with full flare at sides for extra protection against chemical splash.

Weighs less than an ounce!

WILLSON FEATHERSPEC®

. . . specially designed for light-duty operations. Comfortably worn over prescription glasses. Their clear or Tru-Hue green plastic lenses can be switched in a few seconds.

See your Willson distributor or write for bulletin

WILLSON PRODUCTS, INC
225 Washington St., Reading, Pennsylvania

- √ Built to withstand the punishment of handling heavy loads of rock when loaded with big buckets.
- √ Rock bodies fabricated of ¼ (or heavier) steel plate for maximum strength.
- √ Rigid reinforcing provided with box-member ribs. Scoop ends standard.
- √ Floor has 2" hardwood cushion, sandwiched between truck bottom and ¼" wearing plate, to absorb loading shock.
- √ Reinforced steel subframe welded integrally with the body to support the load uniformly and distribute the lifting forces of the hoist without bulging or distortion.
- √ Subframe construction with both cross members and long members interlocked and welded into a single assembly to prevent sagging of body floor.
- √ Individually engineered to your requirements for body length and load distribution.

Strong Arm HOISTS

- √ Arm assembly made of structural steel welded to extra heavy reinforced tubing.
- √ Simplified design eliminates unnecessary troublesome parts. The simple toggle principle of the linkage requires extremely low oil pressure.
- √ Hoist frame designed to take all stresses imposed by action of the hoist without transferring any stress to truck frame.
- √ Endurance-tested hoist cylinder is precision-engineered to raise and hold loads efficiently and dependably.
- √ Fast-acting hoist mechanism elevates body to over 50° dumping angle within 12 seconds after raising cycle is started.

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District Offices: Hillside, Washington, D. C., Atlanta, Cleveland, Milwaukee, Detroit, Chicago, Kansas City, Denver, Dallas, Los Angeles, Seattle

BH-4

13 AND 18-YD. HEILINER SCRAPERS

20-YD. BOTTOM DUMP WAGONS

CONTRACTOR'S BODY

NO!

Here, conventional U-Bolt clips are properly applied but rope is distorted and subject to life-shortening strains under load.

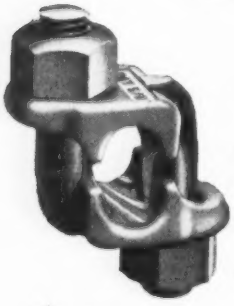
NO!

Inexperienced workmen can easily put conventional U-Bolt clips on incorrectly with saddles not on load-line. Result: Weakened rope — risk of accidents.

It CAN'T Go On Wrong

Both halves of the Laughlin Safety "Fist Grip"* clip are identical. There is no wrong way. The most careless workman can't put 'em on wrong (unless he forgets to tighten the nuts). And they're not only safer and practically foolproof, but they're a darn sight easier to use.

Here's why:



Nuts are out in the open, can be tightened with any wrench, and don't have to be "inched around."

Bolt ends are shorter and don't get battered or bent. Nuts are always easy to remove when clip is to be re-used.

No crushed rope ends, under "Fist-Grips" to cut off. Rope saved.

Fewer clips are required in many installations, so there is less work to do.

"Fist-Grip" Clips are just one example of many LAUGHLIN EXCLUSIVES in design, safety and quality that make Laughlin your best buy in wire rope and chain fittings.

Look for the trademark *to be sure*

THE THOMAS LAUGHLIN COMPANY
26 FORE ST., PORTLAND, MAINE

LAUGHLIN

THE MOST COMPLETE LINE OF WIRE ROPE AND CHAIN FITTINGS

*Patented, T.M. Reg.

Pull Out Broken Drill Bits and Rods Quickly, Easily

DINGS POCKET-SIZED MAGNETIC EXTRACTOR SAVES TIME, MONEY AND LABOR . . .

JUST attach the Dings Drill Extractor to an old jackbit, insert in hole and pull out detached bit or broken rod . . . in minutes a tough job is done and a hole is saved.

Try one—just $10.00 for the 1¼" diameter Extractor, $12.00 for the 1⅝", $20.00 for the 2⅛". Money back in 30 days if you're not satisfied. Send order to Dings Magnetic Separator Co., 4716 W. Electric Ave., Milwaukee 46, Wis.

DINGS MAGNETS

CAN YOU AFFORD TO BE WITHOUT THE

Scintillometer

LOCATE URANIUM 100 TIMES EASIER. THE ONLY PORTABLE GAMMA RAY DETECTOR EMPLOYING CRYSTAL SCINTILLATION. DETECTS ALMOST 100% OF GAMMA RAYS IN COMPARISON TO LESS THAN 1% DETECTED BY THE GEIGER COUNTER.

PORTABLE OR AIRBORNE
ALL TYPES GEIGER COUNTERS;
SPECIAL LONG PROBE COUNTERS
FOR TESTING DRILL HOLES;
ULTRA VIOLET LIGHTS

Engineers Syndicate, Ltd.

The House of Geiger Counters
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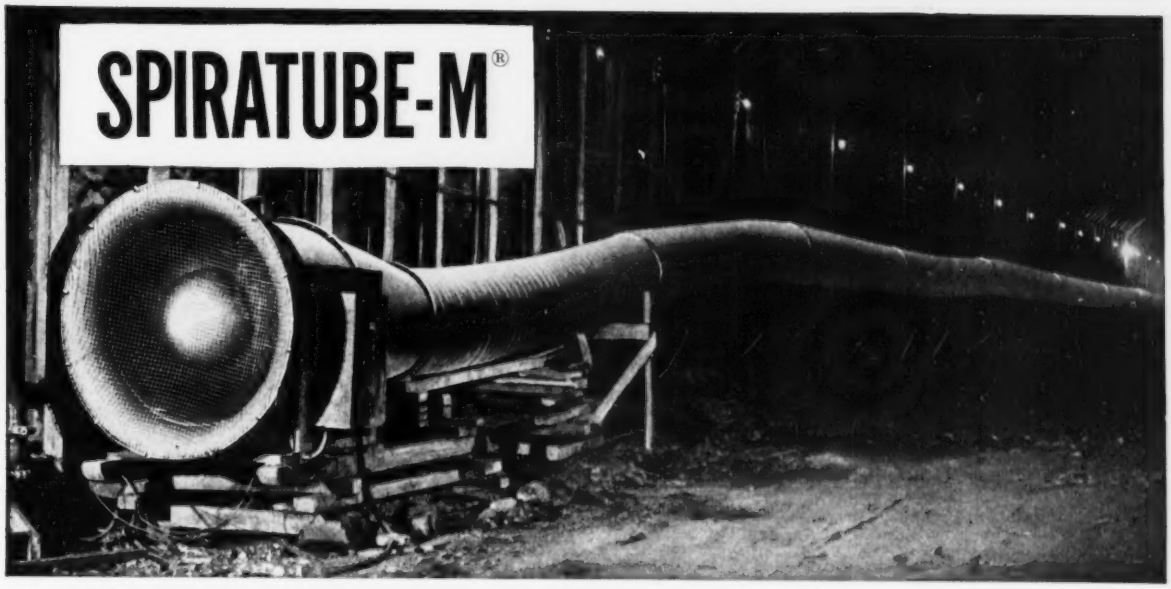
Hollywood 27, California



Simplify mine and tunnel ventilation

Here's the airduct that can take it! Now you can deliver air to the working face of mine or tunnel — cheaper! That's because SPIRATUBE-M is built to cut maintenance costs! Ease of handling reduces installation costs. Unique SPIRATUBE-M construction features minimize leaks and seepage. And you get the maximum efficiency of your blower or fan . . . cutting power costs!

Immediately available in diameters to 30 inches, from fully-stocked distributors, SPIRATUBE-M is made in tough high count fabrics, all specially treated and heavily coated inside and out to withstand fungus, mildew and rough treatment.

And, patented, *built-in*, quick-couplers eliminate the need for separate parts . . . no need to look for couplers when you're in a hurry.

For heavy duty, pressure ventilation tubing without wire reinforcement, ask for AYRTUBE®. Sold in diameters to 36", AYRTUBE by itself or in combination with SPIRATUBE-M offers you an inexpensive airducting.

Check these features:

Handling ease

Lightweight

Flexible

Easily installed by you

Takes sharp turns without crimping

Withstands fungus, mildew, rough treatment

Flexible Tubing
CORPORATION

Guilford, Connecticut • Pasadena 1, California

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Send me your SPIRATUBE-M Booklet

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New Garlock Molded Cups Folder describes in detail our complete line of cups. Write for your copy today!

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For Pump Pistons— Hydraulic Service— Pneumatic Equipment

A COMPLETE LINE OF CUPS FOR INDUSTRIAL USE

GARLOCK Molded Packing Cups are made from the highest grade materials to rigid specifications for *long, trouble-free service.* These cups are made in many types and styles, each designed and constructed for a specific service condition.

BITAN* Leather Cups, available for practically any cylinder diameter size, are recommended for use against cold and hot water, oils, gases, and solvents. For hot oil service up to 250°F., specify synthetic-rubber-impregnated Bitan leather cups.

Rubber and Synthetic Rubber Cups with fabric insertion are made in a wide range of material combinations for cylinder diameters from less than ½" up to and including 16". For service against air at high or low pressures, against oils, and on heavy duty hydraulic equipment.

Cups for Pump Pistons are available for standard cylinder sizes.

Start cutting maintenance and replacement costs now— standardize on Garlock Molded Cups.

THE GARLOCK PACKING COMPANY, PALMYRA, NEW YORK
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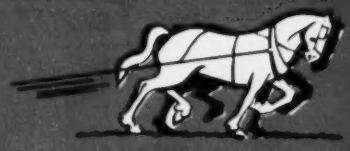
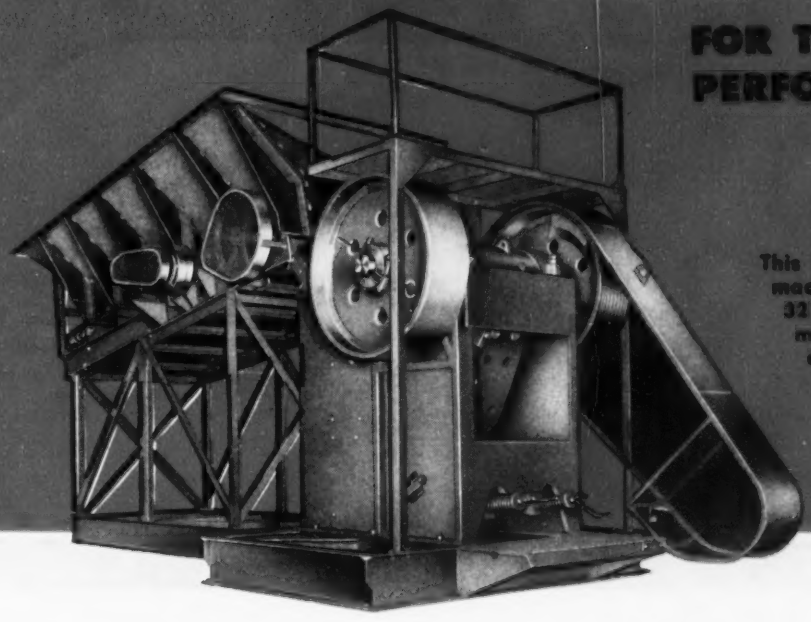
A Matched Team... by ROGERS



FOR TOP PERFORMANCE



This hard-working team, made up of a ROGERS 32 x 40 JAW CRUSHER mounted on skids with a ROGERS 40-in. x 12 ft. APRON FEEDER is the answer to many primary crushing needs.

ROGERS JOPLIN

OVER half a century of experience stands behind all ROGERS equipment... for crushing, sizing, conveying, hoisting and mining. For reliability, performance and service-life, ROGERS on the name plate is your assurance of undivided responsibility for the successful operation of your equipment.

You can RELY ON ROGERS equipment for efficient, low cost mining.

ROGERS EQUIPMENT:

- Apron Feeders
- Reciprocating Feeders
- Portable Crushing Plants
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- Washers
- Drill Jumbos
- Mine Hoists
- Revolving Screens
- Vibrating Screens
- Live Roll Grizzlys
- Underground Loaders
- Elevators
- Roll Crushers
- Hammermills

ROGERS IRON WORKS COMPANY

Joplin, Missouri

Industrial rubber products especially built for LONG SERVICE

PIONEER

"Toughest, Lightest Hose We Could Find"

A NEW DEVELOPMENT—PIONEER TRACK KING

TRACK KING gets its exceptional strength and light weight through use of a tightly woven, tough nylon reinforcement. Its cover is abrasion and impact-resistant Pioneer Rubber—bright yellow for peak visibility.

The arrival of Pioneer TRACK KING was a revelation to the men digging this wet, narrow Seattle sewer tunnel. After a long struggle with ordinary cumbersome pneumatic hoses, it was really a pleasure to handle TRACK KING. And yet it proved more capable of taking the unusually tough punishment found on this 1400-foot tunnel job.

Air hose was important because drilling, shoring, and transporting were all done pneumatically. The workmen not only had to contend with the cramped conditions of a nine-foot face, but also had to fight 52,000 gallons of seepage a day.

Pioneer TRACK KING made the best of this tough, crowded assignment. The men said they hardly noticed this light weight hose on their pneumatic tools, in contrast to previous bulky hoses. It improved the efficiency of every tool on the job.

Regarding its strength, Walter Carlson, the superintendent, said this: "In spite of the watchfulness of the men and the bright yellow cover, the trucks ran over the hose five or six times a day *with no apparent damage.*"

In getting this tough tunnel job under way the Valley Construction Company tried nearly every premium pneumatic hose on the market. But they were really enthusiastic when they found exactly what they wanted in TRACK KING.

Investigate Pioneer TRACK KING, yourself. It is the lightest, strongest air hose you can buy. Ask your Pioneer representative for complete details on this and the many other Pioneer industrial rubber products available now.

PIONEER RUBBER MILLS

Pioneering in rubber since 1888

BRANCHES: CHICAGO • DALLAS • LOS ANGELES
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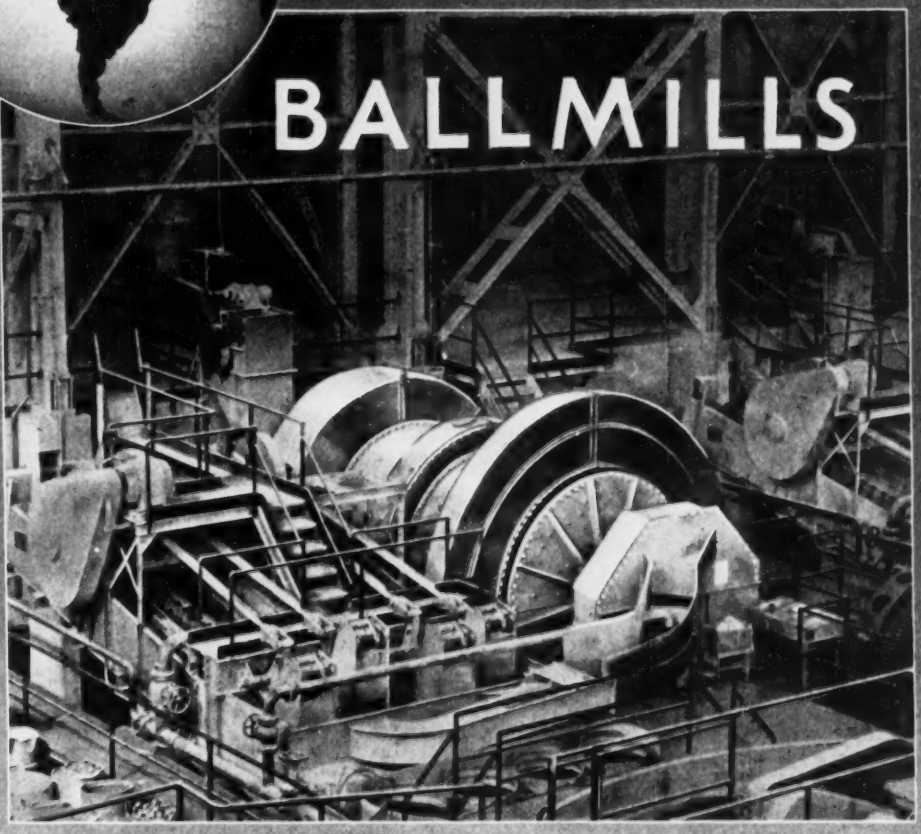
SMIDTH

BALLMILLS



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OPEN OR CLOSED CIRCUIT

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F. L. Smidth & Co. (Bombay) Ltd.
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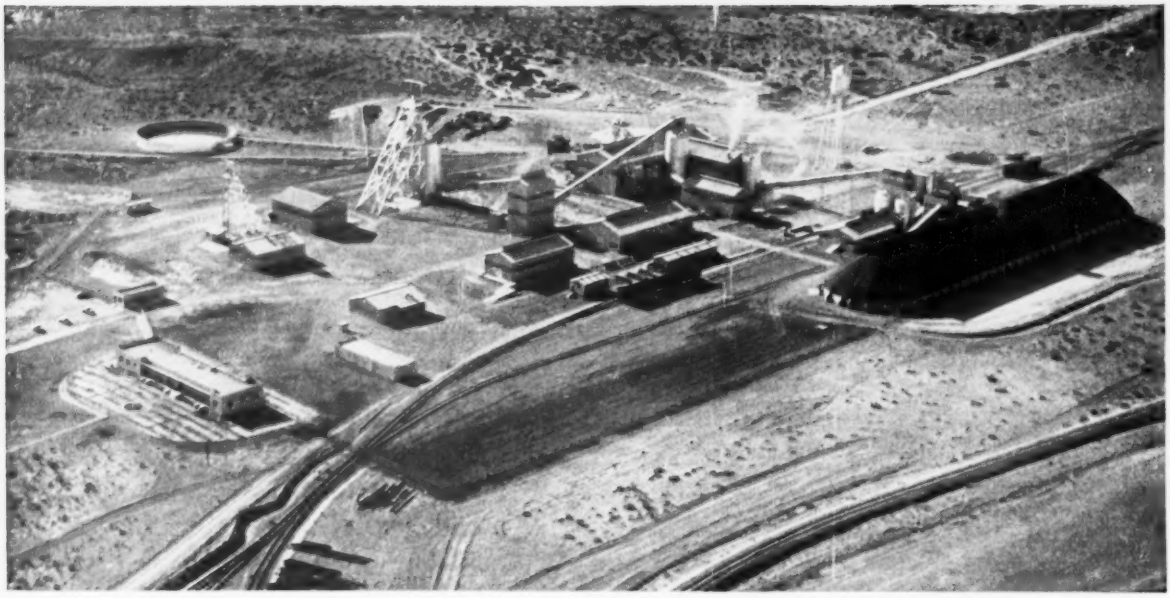

Overall air view of one of the most modern potash refineries in America

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Plants like this potash operation require a minimum of operating labor and consequently will show profits in tomorrow's competitive markets.

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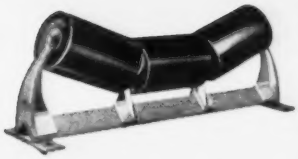
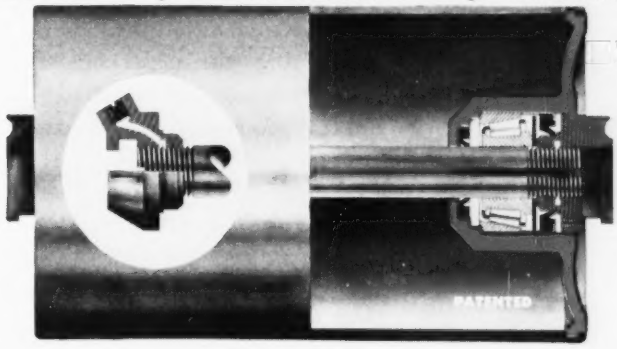


CGC UNIT-SEALED CGC PRE-LUBRICATED CGC TIMKEN BEARINGS



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For detailed information on these idlers write for Bulletin E.M.-116

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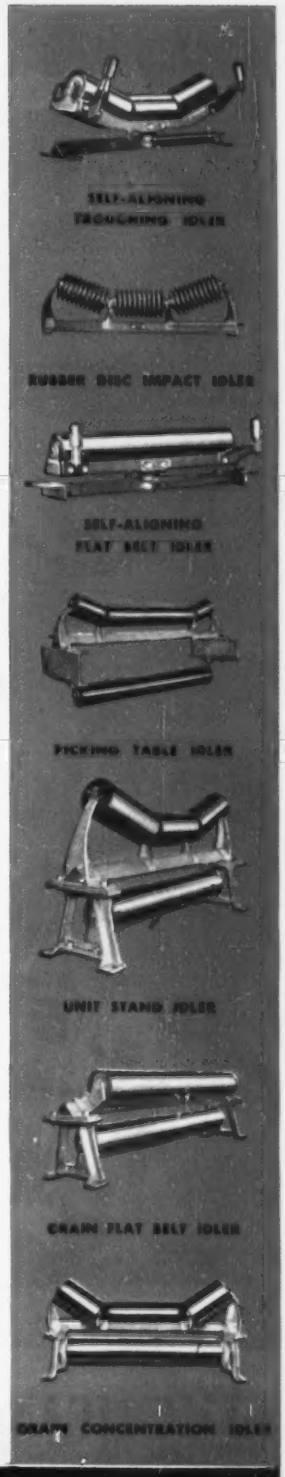
CG-5210



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ROTO-CLONE Type N Arrangement D . . . and cutaway showing operation of water curtain.

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2. Low Cost—a ROTO-CLONE wet collection system costs no more than other dust collectors of comparable efficiency. However, its small space requirements and factory method of assembly reduce installed costs. Operating features also reduce maintenance. The ROTO-CLONE system of bringing the dust to the water makes effective use of every gallon supplied.

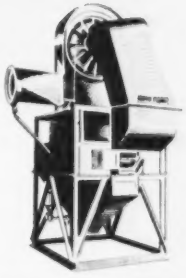
3. Uniform Air Delivery—the exclusive ROTO-CLONE engineering features supply constant air volumes and continuous efficiency dust control.

4. No Secondary Dust—ROTO-CLONES eliminate rehandling and disposal of dry dust. Dust is collected in sludge form within the self-contained unit and may be disposed of in several ways. For one . . . it may be sluiced, either intermittently or continuously.

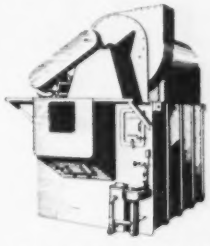
The principal applications for wet-type collectors in the mining field are • Ore Crushing • Screening • Material Drying • Conveyor Transfer • Milling • Sampling • Roasting • Sintering.

For complete information on the many ROTO-CLONE types, sizes and applications call your nearby AAF representative or write for Engineering Bulletin No. 270A.

**ROTO-CLONE is the trade-mark (Reg. U.S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydro-static precipitator types.*



Type W ROTO-CLONE



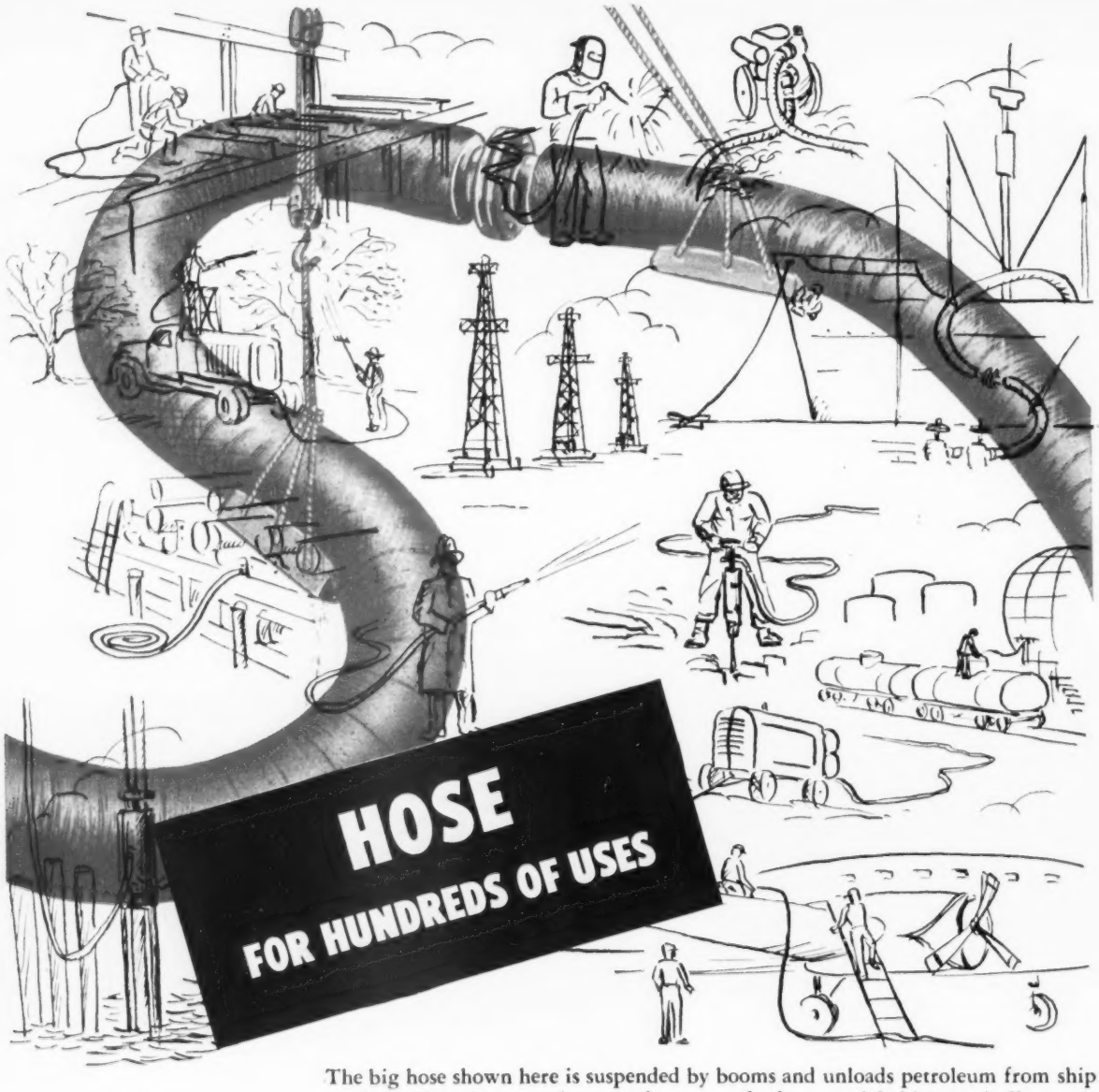
Type N ROTO-CLONE Arrangement B

AAF

American Air Filter

COMPANY, INC.

193 Central Ave., Louisville 8, Ky. • American Air Filter of Canada, Ltd., Montreal, P.Q.



The big hose shown here is suspended by booms and unloads petroleum from ship to shore. Whether your hose needs are standard or special, it's practically a certainty Raybestos-Manhattan engineers have already designed the right hose for you. R/M hose constructions range from as small as ¼" paint spray hose to huge dredging hose big enough for a man to crawl through. The point is, you can't go anywhere to find better facilities or more experienced engineering to help you with a hose problem, than at Raybestos-Manhattan . . . and not only hose — it's true also of transmission, conveyor and V-belts . . . and all other products we make. Consult your **R/M representative.**

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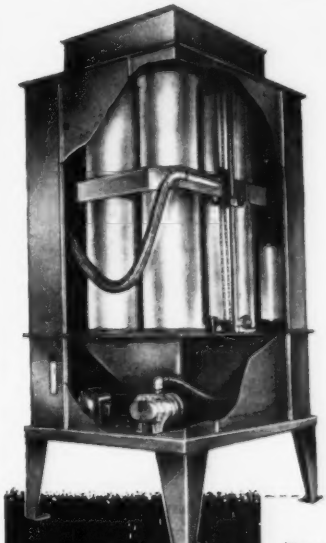

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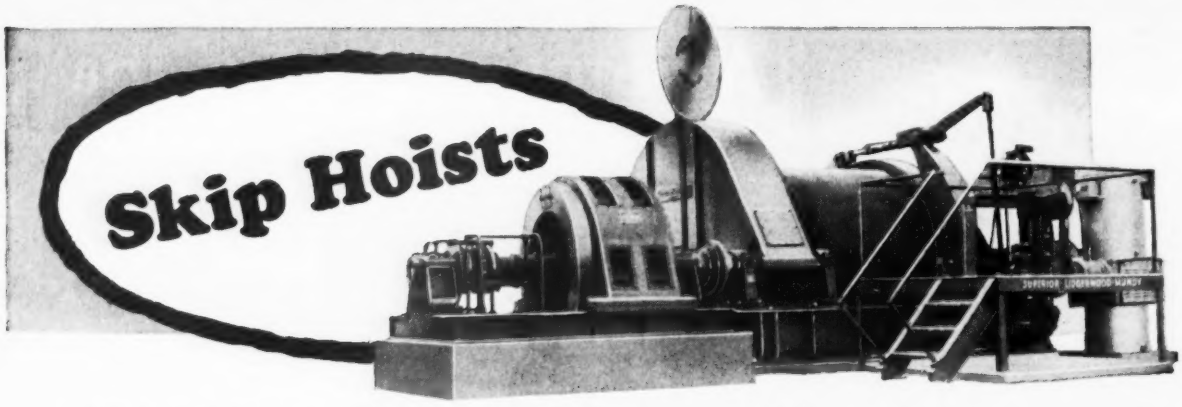
Skip Hoists



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The transporting of ore by means of Lidgerwood Skip Hoists offers a conclusive solution to the rising maintenance costs involved in other methods of handling. This is substantiated by the ever increasing Skip Hoist installations on the MESABI IRON RANGE . . . one of which is shown.

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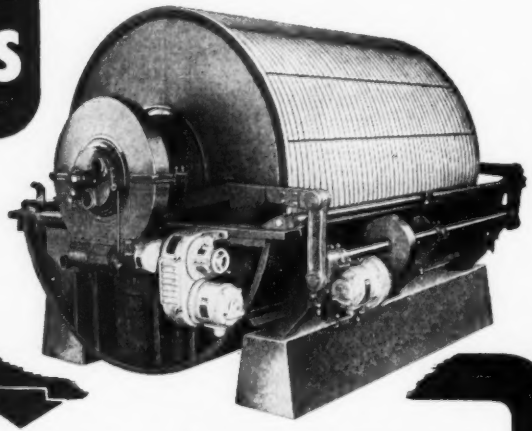

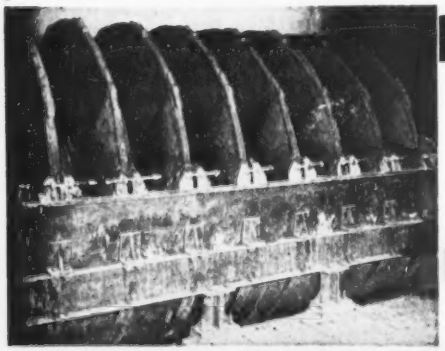

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MORSE DISC FILTERS are ideal for filtering more than one character of concentrate or material where separated filtrates are desired.

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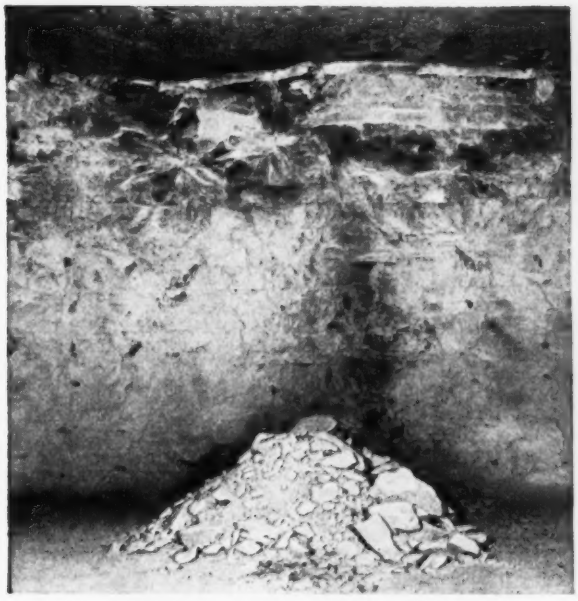
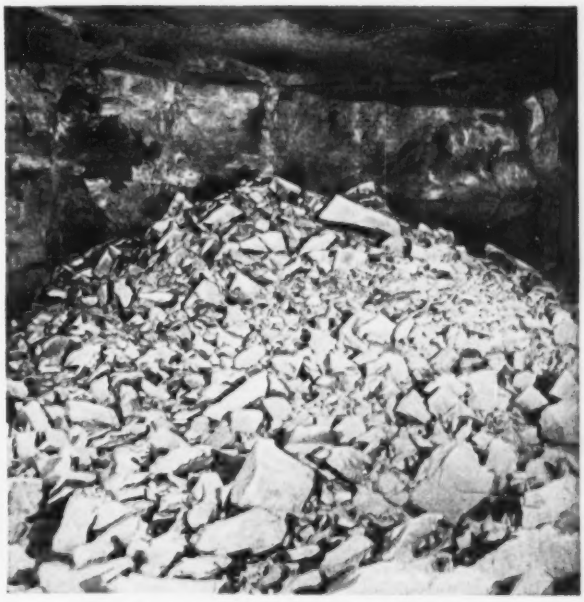
UNIFORM FRAGMENTATION

with Du Pont "Extra" Dynamite and "MS" Delay Caps in southern limestone mine



Face drilled and ready for loading in Franklin Limestone Mine.



Results with "MS" Caps consistently produce more uniform fragmentation.

● Rooms average about 26 feet high . . . 48 feet wide in the southern limestone mine property of the Franklin Limestone Company, Franklin, Tennessee.

Typical shots consist of some 48 holes arranged in vertical rows of six each. These are loaded with Du Pont "Extra" D-1 Dynamite (40%) and are primed with Du Pont "MS"* Delay Electric Blasting Caps of 25, 50, 75, 100, and 125 millisecond delay periods.

"MS" Caps enable the mine operators to use less dynamite per blast and to obtain a much better and more uniform quality of fragmented rock. In addition, these caps greatly reduce concussion throughout the mine.

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*"MS" Delay Electric Blasting Caps are available in 14 millisecond delay intervals: MS-25, -50, -75, -100, -125, -150, -175, -200, -250, -300, -350, -400, -450, -500

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Blasting Supplies and Accessories

DU PONT

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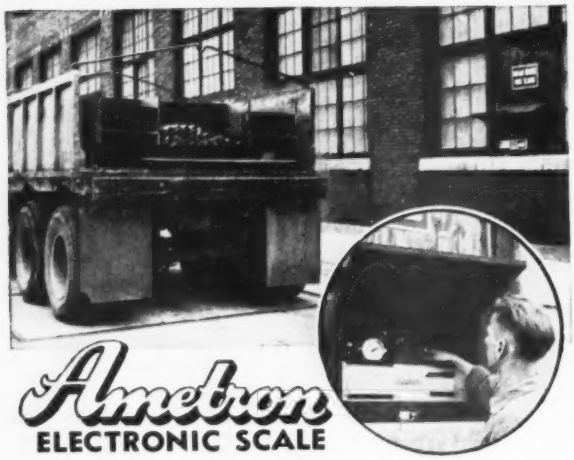

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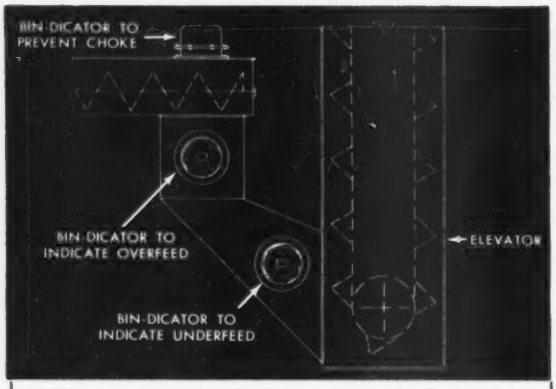

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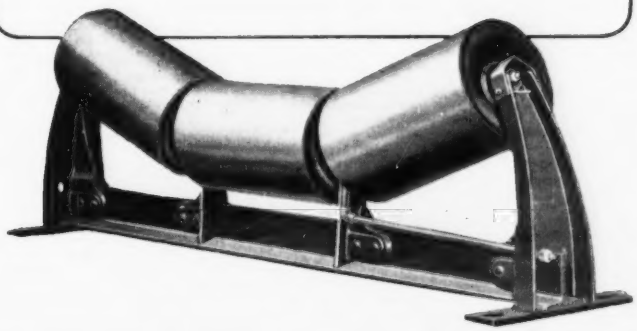
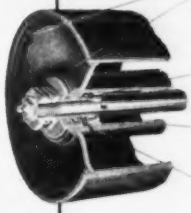
Why LINK-BELT IDLERS require minimum lubrication and adjustment

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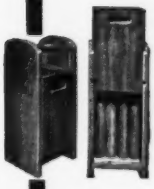

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Lower per foot drilling costs with

ASCOLITE • NICOLITE • BRONZOLITE

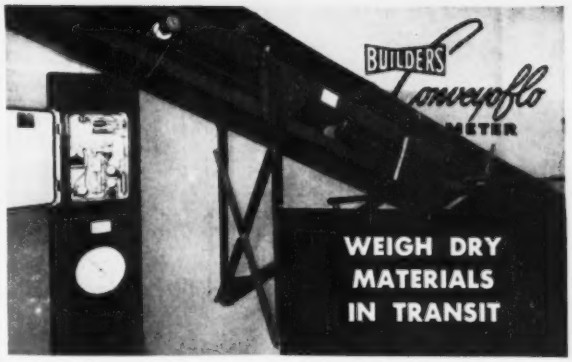
DIAMOND BITS BY

EST. 1908 **ANTON Smit** & CO. INC.

Importers and Dealers • Carbons, Bortz, Ballas
Manufacturers of Diamond Tools

333 W. 52nd St., New York 19, N. Y. Cables: PROFITABLE, New York

Send for catalogs



This precision meter totalizes the weight of dry material passing over conveyor belts continuously, automatically, accurately. Available as a separate, self-contained unit — or for installation in your present conveyor lines.

EXCLUSIVE FEATURES:

- **Accurate . . . within ± ½ of 1% of actual weight from maximum to 50% of rated capacity; within 1% from 50% to 25% rate; within 2% from 25% to 10% of meter's rated capacity.**
- **Automatic totalizer compensation for variations in belt speed and changes in belt weight.**
- **Responds accurately to rapid load variations.**
- **Paces auxiliary equipment (feeders, controllers, continuous blending processes, etc.) and operates secondary instruments.**

•

Write for Bulletin 550-H4, giving complete details. Builders-Providence, Inc. (Division of B-I-F Industries), 391 Harris Ave., Providence 1, R. I.

B-I-F INDUSTRIES **BUILDERS-PROVIDENCE** BUILDERS

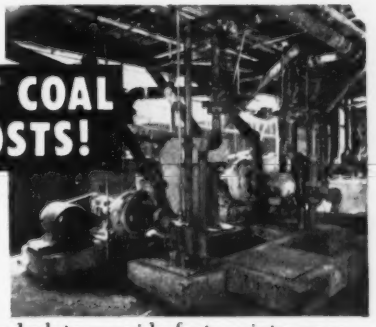
His business paper . . . of course

No man who takes his job seriously takes his business paper lightly. The **Best Informed Men in your Field** read every issue . . . straight through. They can't afford not to. Matter of fact, who can? You *need* the continuous touch with facts, news and "how-to" that only your business paper provides. Cover-to-cover reading makes *you* one of the **Best Informed Men in your field,** too.

Engineering and Mining Journal

One of a series of ads prepared by THE ASSOCIATED BUSINESS PUBLICATIONS

NAGLE PUMPS CUT COAL PREPARATION COSTS!



Three Nagle 6" type "T" pumps are shown handling slurry to waste from coal washing operations at a modern preparation plant.

Split bearing stand and quick-off end plate provide fast maintenance or dismantling. Easy-to-reach stuffing box. Simple, fast slippage seal adjustment. Wear resistant water end parts—features that cut cost and eliminate shut-downs. Reasons why more and more coal companies are turning to Nagles. Get the facts!

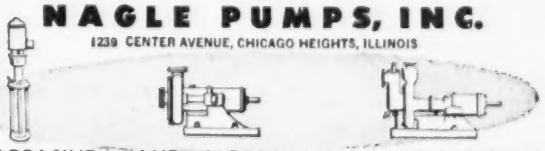
THE NAGLE PRIMING INDUCTOR

Facilitates priming of pumps stationed above water level. Basically a water operated jet, it fills pump intake pipe with the liquid necessary to start operation. Easy to install—efficient.

NAGLE PUMPS

NAGLE PUMPS, INC.

1239 CENTER AVENUE, CHICAGO HEIGHTS, ILLINOIS



PUMPS FOR ABRASIVE AND CORROSIVE APPLICATIONS

Eliminate 70% to 90% of Conveyor Downtime

Cedarapids Schrock Built by IOWA

MOTORIZED HEAD PULLEYS

eliminate maintenance on chains, belts, sprockets, Universal drives, countershafts, etc.

EVERYTHING is contained INSIDE the pulley shell!

HERE'S a money-saving departure from conventional conveyor drives. A Cedarapids-Schrock *Motorized* Head Pulley is simply a new application of the long-proven gear reduction drive, with everything . . . electric motor, reduction gears and all moving parts . . . contained inside the drum, completely protected from grit, dirt and weather and with no outside parts or motors to service. 70% to 90% of conveyor trouble and downtime is saved by eliminating the exposed parts necessary with conventional pulley drives. In operation, the pulley shell rotates about the electric motor which is held stationary by a torque arm attached to the conveyor frame. The speed of the shell depends on the combined reduction ratio of the pinions and gears inside the shell. Compact, easy-to-install, job-proved Motorized Head Pulleys are available in sizes from 5 to 30 HP and in various widths.

Find out all the advantages of converting your belt conveyor or belt-bucket elevator installations to *motorized* efficiency before you need head pulley replacements. See your distributor today, or write for Bulletin MP-1.

IOWA MANUFACTURING COMPANY
Cedar Rapids, Iowa, U. S. A.

Built for sale in Arizona, California, Nevada, New Mexico, Southern Oregon, Southwestern Utah and Texas by
YUBA MANUFACTURING CO.
(Pulley and Sprocket Department)
Benicia, Calif.

KENNAMETAL *Inc.*

BUYS **TANTALITE • COLUMBITE (NIOBITE)**

***Also:* TUNGSTEN CONCENTRATES • COBALT**

Prompt, businesslike settlement by private tantalite user and dealer secures you the best results. Cash advance against settlements. 50% or higher combined pentoxides (Cb_2O_5 plus Ta_2O_5) purchased. Our superior refining processes enable us to utilize lower grade products and thus to minimize penalties.

Write or cable your offer to:

KENNAMETAL *Inc.*,
LATROBE, PA. U. S. A.

MANUFACTURERS OF SUPERIOR CEMENTED CARBIDES

he's working for you

THIS FELLOW IS TRAINED IN YOUR BUSINESS. His main duty is to travel the country — and world — penetrating the plants, laboratories and management councils . . . reporting back to you every significant innovation in technology, selling tactics, management strategy. He functions as your all-seeing, all-hearing, all-reporting business communications system.

THE MAN WE MEAN IS A COMPOSITE of the editorial staff of this magazine. For, obviously, no one individual could ever accomplish such a vast business news job. It's the result of many qualified men of diversified and specialized talents.

AND, THERE'S ANOTHER SIDE TO THIS "COMPOSITE MAN," another complete news service which complements the editorial section of this magazine — the advertising pages. It's been said that in a business publication the editorial pages tell "how they do it" — "they" being all the industry's front line of innovators and improvers—and the advertising pages tell "with what." Each issue unfolds an industrial exposition before you — giving a ready panorama of up-to-date tools, materials, equipment.

SUCH A "MAN" IS ON YOUR PAYROLL. Be sure to "listen" regularly and carefully to the practical business information he gathers.

McGRAW-HILL PUBLICATIONS

You Get
LONG LIFE
from Norton Grinding Wheels

Reduce your grinding costs, get longer wheel life . . . by specifying Norton grinding wheels.

Cool-cutting Norton ALUNDUM* wheels give maximum efficiency in sharpening steel bits. Made from a special aluminum oxide abrasive that is hard and tough, they have just the qualities you want for grinding rock bit steel.

For your carbide tipped bits you'll like Norton green CRYSTOLON* wheels. They are made of a special type of hard, sharp silicon carbide abrasive and an improved vitrified bond. It's a combination that will give you just the right grinding action for sharpening the high cost carbides.

For cutting drill steel, specify Norton ALUNDUM cut-off wheels and Norton cup wheels for dressing or squaring ends of steel after it is cut.

Your Norton Distributor Can Give You Valuable Help

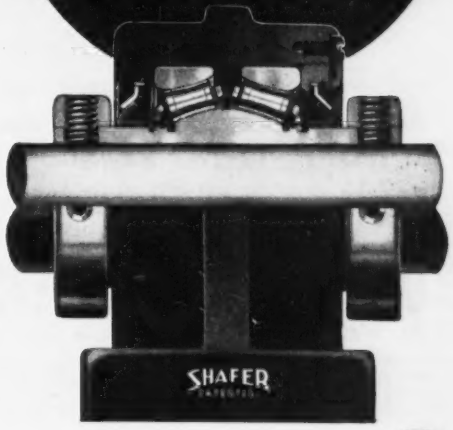
Besides his own practical experience with abrasive applications in the mining field, your Norton Distributor can call in Norton Abrasive Engineers for additional expert aid in solving your grinding problems. Take advantage of the wide store of helpful knowledge he makes available to you. See him for the right wheels to use in *any* grinding job. NORTON COMPANY, Worcester 6, Massachusetts. Distributors in all principal cities. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.

NORTON
ABRASIVES

Making better products to make other products better

*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

THE *Rugged* JOBS ARE "*Routine*" FOR SHAFER BEARINGS



Throughout the land Shafer Roller Bearings are increasing the nation's productive capacity—carrying big loads, saving money and power, reducing down time and maintenance costs wherever America's heaviest duty power transmission equipment is at work.

Shafer Bearings handle these tough jobs better because they are engineered to-the-job—to provide *longer* life, *greater* dependability and *lower* operating costs under the severest working conditions. Integrally self-aligned, they have full radial-thrust and greater reserve shock load capacities under all conditions of misalignment; are equipped with self-centering "Z" housing seals and Micro-Lock 12-point adjustment. See the Shafer bearing specialist near you . . . or write us direct . . . for complete information and engineering consul on a no-obligation basis. SHAFER BEARING CORPORATION, 801 Burlington Avenue, Downers Grove, Illinois.

Pillow Blocks

Flange Units

Flange Cartridge Units

Cartridge Units

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Take-Up Units

Unmounted Bearings

SHAFER
SELF-ALIGNING ROLLER BEARINGS

Take-Up and Frame Units

Aircraft Control Bearings

HIGH COSTS CAN BE LOWERED

Get a little more squeal out of that tail—*It's clear profit.*

Clean up that concentrate—*It's clear profit too.*

WORLD WIDE EXPERIENCE

PERSONALIZED . . .

. . . to give you a greater dollar return from the treatment of your ores. Tailing loss reduction *IS MONEY IN THE BANK!*

[COMPLETE ORE TESTING SERVICE LABORATORY & PLANT]

BOOTH ENGINEERS

146 So. West Temple • Salt Lake City, Utah

MINERALS SEPARATION • SERVICE • EQUIPMENT

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ORE CONCENTRATES, RESIDUES, METALS;

Sellers of

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The UNITED STATES and CANADA For LARGE MINING and INDUSTRIAL COMPANIES

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SOUTH AMERICAN MINERALS & MERCHANDISE CORPORATION

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(Classified Advertising)

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$1.20 per line, minimum 3 lines. To figure advance payment count 5 average words as a line.

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Individual Spaces with border rules for prominent display of advertisements.

The advertising rate is $12.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞" vertically on one column. 3 columns—30 inches—to a page.

New Advertisements: Address N. Y. Office, 330 W. 42nd St., N. Y. 36, N. Y., for March issue closing February 19th E.M.J.

FIELD ELECTRICAL ENGINEER

Whose duties would be to supervise the work done by the District Electrical Foreman in the various camps. This applies to the Plant with its auxiliary services and covers power distribution and utilization, but in general not power generation or transmission, large copper company Chile, South America. 3-year contract.

Transportation both ways and salary while traveling paid by Company.

In reply give complete details.

P6066 Engineering & Mining Journal 330 W. 42nd St., New York 36, N. Y.

FOR FRENCH MOROCCO

1 Metallurgist. College deg. $16,500
Expd. in low grade oxide and sulfide copper ore treatments, milling and smelting.
1 Assistant for above $11,000
2 Mineral Geologists $15,500
10 years exp. in all metals.
J. L. Overholt Wabash 2-5020
WABASH EMPLOYMENT AGENCY
202 S. State Street Chicago, Ill.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42 St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITIONS VACANT

CHIEF CHEMIST: Qualified to supervise good volume of routine determinations on ores, concentrates, mill products. Must be able to train and check native technicians also organize efficient handling by modern methods. Knowledge of sampling methods desirable. P-6625, Engineering News-Record.

EXPERIENCED GRADUATE metallurgists and metallurgical engineers required for large research and development organization in Northern Rhodesia. Duties relate to process metallurgy of copper, cobalt, lead, zinc and other base metals, with emphasis on ore concentration by flotation. Applicant must have minimum 5 years industrial experience. Total remuneration, $2,000 to $2,500 according to qualifications and experience, comprises basic salary, variable metal bonus and cost of living allowance. Generous pension and leave privileges. Housing provided at nominal rental. Free transportation to Northern Rhodesia for successful applicant and immediate family. Applications stating age, marital status, qualifications, experience record, availability, and accompanied by a recent photograph should be addressed to The Secretary, P.O. Box 172, Kitwe, Northern Rhodesia.

POSITIONS VACANT

MINING OR Mechanical Engineer to assist in export sales of mining and earth moving equipment. Knowledge of foreign languages helpful. Location New York City. State salary desired. P-6644, Engineering & Mining Journal.

SENIOR RESEARCH Metallurgist: 5-8 years' research experience in concentrating and floating base metal ores. Some operating experience desirable. P-6623, Engineering & Mining Journal.

WANTED: EXPERIENCED Mining Engineer for Exploration, Evaluation and Operations. Man required for both domestic and overseas work. Job may require residence abroad. Excellent Opportunity. P-6670, Engineering & Mining Journal.

WANTED: SENIOR Research Metallurgist under 45 and Chief Chemist under 40, by long established Mediterranean mine where living conditions are excellent. Three year contract, liberal vacations. Salary open. Submit record of education, experience, references, photograph optional. P-6621, Engineering & Mining Journal.

POSITIONS WANTED

MECHANICAL SUPERINTENDENT, 27 years' experience all phases mechanical maintenance and on all classes of mining and open pit operations, milling—concentrating and smelting; railway and trucking transportation; and their individual shops. Speak Spanish fluently. Will accept domestic or foreign assignment. PW-6698, Engineering & Mining Journal.

MINING ENGINEER AIMME, good qualifications, 8 years experience in mining, 5 years in design of mining and ore dressing equipment, in large companies, actually in gold mining in South America, appeals for position. PW-6513, Engineering & Mining Journal.

MINING ENGINEER (Dutch) Graduated at the Inst. of Technology—Member AIME—is looking for employment. 30 years experience in Coal—Silver—Gold—Iron—and Tungsten mining. Builder of several Mine- and Oredressing plants. Speaks five languages. Has knowledge of relations for development of good, small Portuguese Tungsten mines but failed to assemble needed capital because specially free dollars wanted. PW-6483, Engineering & Mining Journal.

(Continued on opposite page)

SINCE 1898 DEPENDABLE RECONDITIONED MACHINERY

LOCOMOTIVES

1—1½ Ton Mancha Trammer
1—2-2½ ton Whitcomb Battery, 24" gauge
1—2½ ton Jeffrey battery or trolley, 36" gauge
1—3½ ton Mancha battery, 25" gauge, with 2 sets Edison batteries and charging set
1—4 ton Ironton battery, 36" gauge
2—7 ton General Electric permissible battery, 36" gauge
1—7 ton Atlas battery, 36" gauge
3—8 ton Ironton battery, 36" gauge
2—8 ton General Electric battery, 36" gauge
4—10 ton Atlas battery, 36" gauge
1—4½ ton Goodman trolley, 36" gauge
1—5 ton Jeffrey trolley, 36" gauge
1—6 ton Goodman trolley, 36" gauge
2—8 ton Goodman trolley, 36" gauge

FLOTATION MACHINES

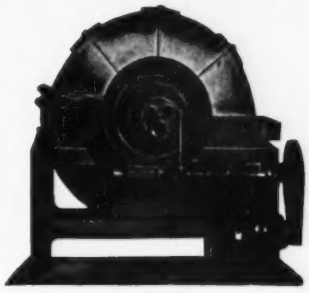
1—New Morse Jetair #7 Hydra-cell
1—New Morse Jetair 2 cell #7
1—Fagregan Single cell
1—6 cell 18" Stearns-Roger
1—6 cell Denver "Sub A" #18
1—6 cell Denver "Sub A" #21

HOISTS—ELECTRIC

1—10 HP Vulcan #0 Single Drum
1—15 HP Morse New Single Drum
1—20 HP H&B Single Drum
1—22 HP Vulcan Single Drum #1½
1—30 HP Vulcan Single Drum
1—3 HP Vulcan Double Drum
1—3 HP Single Drum
2—52 HP Vulcan #4½ Single Drum
1—50 HP Fairbanks-Morse Single Drum
1—60 HP H&B Single Drum
1—60 HP Vulcan #23ELF Single Drum
4—100 HP Box Single Drum
1—112 HP Vulcan Single Drum
2—150 HP Vulcan Single Drum
1—350 HP Dillon-Box Single Drum
1—600 HP Box Single Drum

THICKENERS

1—12' Dorr lowhead thickener with 10' deep redwood tank
1—24' Dorr lowhead thickener with 12' redwood tank



FILTERS

1—4' Single Disc Oliver Filter
1—6' 2-disc American Filter
1—6' 3-disc American Filter
1—4' x 2' Dorrco Filter
1—4' x 6' Morse Drum Filter
1—18" Morse Round Pattern Filter Press
1—36" Merrill Triangular Filter Press
1—#12 Sweetland Filter Press, 36 leaves.

JAW CRUSHERS

2—9" x 14" Universal, #3M
1—9" x 15" Wheeling
1—9" x 15" Farrell
1—9" x 16" Universal
1—9" x 24" Rogers
1—8" x 36" Universal
1—11" x 18" Universal
1—24" x 13" Farrell

BALL & ROD MILLS

1—4' x 4' Standard Ball Mill
2—6' x 48" Hardinge Conical Ball Mills with air swept equipment.
1—8' x 22" Hardinge Conical Pebble Mill
1—3' x 8' Marcy Rod Mill

CLASSIFIERS

1—48" x 15' Dorr Multizone Classifier
1—48" x 18' Akins Spiral Classifier
1—40" x 20' Morse Spiral Classifier

BALANCES

1—200 oz. Troemner bullion and specie balance
1—#045 Ainsworth 1 gram assay balance
1—Becker button balance, sensibility 1/50 mg.
1—Keller assay balance, inverted beam, sensibility 1/100 mg.
1—Smith & Thompson assay balance, sensibility .005 mg.
1—Thompson #7 button balance, sensibility 1/200 mg.
1—5000 oz. Fairbanks & Hutchinson bullion balance

BLOWERS & EXHAUSTERS

2—#8H 42 Jeffrey Aerodyne mine fans
8—Jeffrey Aerodyne Midget Exhausters, permissible
4—Jeffrey #61 Exhausters with 3 HP motors
1—Cogeus Ventair blower, Type T, Size 4
3—#250 D.F.C. Furnace Blowers
4—American Type HS New Blowers, 12000 CFM with 2 speed motors.

CONCENTRATING TABLES

4—Wilfley #8 Tables
21—Deister "Plat-O" Tables

CONDITIONERS

1—8' x 5' Dorr Conditioner with redwood tank
2—7' x 7' Morse Conditioners
6—8' x 8' Morse Conditioners
4—10' x 10' Morse Conditioners

Send for Catalog 521E

MORSE BROS. MACHINERY COMPANY

2900 Brighton Blvd. P.O. Box 1708 Keystone 5261 DENVER, COLORADO

POSITIONS WANTED

(from opposite page)

MINING ENGINEER & Geologist, 39, experienced in management and research; open pit, placer, and underground mining, construction, light weight aggregates, prestressed concrete and explosives; excellent Spanish; seeks position, contract or salary, in production or exploration, U.S. or foreign. PW-6210, Engineering & Mining Journal.

BUSINESS OPPORTUNITIES

1000 acres proven manganese lands in heart of Batesville-Cushman quadrangle, producing now, will sell. Write Bee Vanemburg, Owner, Batesville, Arkansas.

Montmorillonite Bentonite Mine—Available to lease for large scale operation or possible sale. Located in San Bernardino County, California. Short haul to railroad. For details write Wm. Hunger, 9821 Burgen Ave., Los Angeles 34, Calif.

CHURN DRILLING CONTRACTORS

exploration and blast hole drilling
Large diameter escapeways, ventilation drainage and pilot holes.

J. D. JUDD & SON
Shullsburg, Wisconsin.

MEXICO FLUORSPAR

$25.00 per ton — 60% effective units
f.o.b. cars Eagle Pass, Texas/ duty pd.

RICHARD N. LANE
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We Specialize in Buying Complete Mining, Milling or Construction Plants

We have purchased 14 within three years. Please contact us before you sell.

BO 5701 Engineering & Mining Journal
520 N. Michigan Ave., Chicago 11, Ill.

OPEN PIT MINING

Contractor with excellent equipment and experienced personnel interested in excavating, material handling, or open pit mining work.

CW1319 — Engineering & Mining Journal
330 W. 42nd St., New York 18, N. Y.

ELECTROLYTIC PROCESS

Low Voltage Direct Current available for Electrolytic process work. Approx. 1500 KW.

CW-6776 Engineering & Mining Journal
330 W. 42 St. New York 36, N.Y.

WANTED INDUSTRIAL PLANTS

Will arrange thru purchase of (1) capital stock, (2) Assets, (3) Machinery and equipment, whole or in part—Personnel usually retained, strict confidence. Box 1351 Church Street Station, New York 8, N. Y.

WANTED UP TO 450 TON MILL OR MILLS

Will require some Flotation Equipment.

W6332 Engineering & Mining Journal
68 Post St., San Francisco 4, Calif.

BUYERS OF SURPLUS COPPER, INSULATED WIRES AND CABLES

No lengths too long or too short.
Telephone: EAstgate 7-4778

PIERCE CABLE CO.
2674 Clyburn Ave., Chicago 20, Ill.

RELAYING RAIL

All Sizes
Track Accessories
LEFTON INDUSTRIAL CORP.
Genl. Office: 212 Victor St.
St. Louis 4, Mo.

4—Mack 9 cu. yd. Dump Trucks, Mod. FH1938
2—Mack 15 cu. yd. Dump Trucks, Thermodyne with Bogie Drive
1—4' Telsmith Gyrasphere Crusher w/ drive
1—#86 Marcy Ball Mill with 225 HP Motor
1—Dillon Double Drum Hoist, Rope Pull, 7,000 lbs., 500 FPM, with 100 HP Motor.
FS 6619 — Engineering & Mining Journal
68 Post Street, San Francisco 4, Calif.

FOR SALE TWO MOBILE REPAIR SHOPS

Designed to provide mobile facilities for maintenance and repair of construction and industrial equipment, vehicles, disaster and civil defense services, etc. Test used only; equal to new. Write for further particulars. EXPORT TRADING CO. 1921½ Talmadge Ave., Los Angeles 27, Calif.

Fairbanks-Morse DIESEL ENGINE

Model 32D — Complete

G. E. SIPE
Box 697, Yale, Okla.

WANTED DOUBLE DRUM HOISTS

Require several large double drum hoists, with electrical equipment. Please send all details.

W-6611 Engineering & Mining Journal
68 Post St. San Francisco, Calif.

CARLYLE
INDUSTRIAL RUBBER PRODUCTS FOR EVERY PURPOSE

IMMEDIATE DELIVERY OF CONVEYOR, ELEVATOR AND TRANSMISSION BELTING — FIRE, WATER, SUCTION, AIR, STEAM AND WELDING HOSE

WHY WAIT

We have 8 to 48

RUBBER CONVEYOR BELTING

TOUGHCOVERS—Heavy duty, specially compounded abrasive resistant rubber covers having high tensile strength. Thoroughly capable of withstanding the abrasive action of bulk materials. Properly vulcanized to the carcass to assure utmost performance, economically.
STRONG CARCASS—Constructed of finest quality 28 and 32 ounce tough cotton duck, properly treated and impregnated to avoid mildew from moisture and atmospheric conditions. Each ply thoroughly embedded in rubber to prevent ply separation.
FLEXIBILITY — Careful attention has been given in the construction of all belts to have the proper flexibility assuring the following desirable features: troughs easily runs true on all idlers, gauge resistant, excellent for long and short hauls and slope installations.

Avoid delays in your production schedules!

We carry in stock for your immediate requirements, Conveyor Belting in widths from 8 inches to 48 inches

Width	Ply	Thickness Top Cover	Thickness Bottom Cover	Type of Duck Carcass
8"	4	1/16"	1/32"	28 Oz.
10"	4	1/16"	1/32"	28 Oz.
12"	4	1/16"	1/32"	28 Oz.
14"	4	1/16"	1/32"	28 Oz.
16"	4	1/8"	1/32"	28 Oz.
18"	4	1/8"	1/32"	28 Oz.
20"	4	1/8"	1/32"	28 Oz.
20"	5	1/8"	1/32"	28 Oz.
24"	4	1/8"	1/32"	28 Oz.
24"	5	1/8"	1/32"	28 Oz.
26"	5	1/8"	1/32"	28 Oz.
30"	4	1/8"	1/16"	32 Oz.
30"	5	1/8"	1/16"	32 Oz.
30"	6	1/8"	1/16"	32 Oz.
36"	6	1/8"	1/16"	32 Oz.
42"	5	1/8"	1/16"	32 Oz.
48"	5	1/8"	1/16"	32 Oz.
48"	8	1/8"	1/16"	32 Oz.

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1— 6 x 12 Wheeling
1—10 x 20 Allis-Chalmers
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MISCELLANEOUS

1—30" x 48" Baker Ball Mill
1—Butchart Concentrating Table
1—3" Dorrco Duplex Diaphragm Pump, with gear motor
1—12" x 5" Denver Lab. Batch Ball Mill — Motorized
1—20' x 10' Thickener — Wood Tank
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Qu.	H.P.	Make	P.F.	Volts	R.P.M.
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1	3000	Whse.	80	4800/2400	720
2	2100	G.E.	100	2300	360
2	1750	G.E.	100	2300	3600
1	750	G.E.	80	2300	450
1	600	G.E.	100	440	360
1	700	G.E.	80	2300	720
1	250	G.E.	100	2300	514
1	200	Whse.	80	440	1200
1	187	G.E.	80	440	720
1	150	G.E.	100	2200	900
1	150	G.E.	100	550	600
1	120	G.E.	80	550	450
2	135	G.E.	80	4000/2200	1200
3	125	El. Mchy.	100	4800/2400	900
1	125	G.E.	80	2200	900
2	100	Whse.	80	440	1800
1	100	Ideal	80	440	900
2	100	G.E.	80	440	600

With these we can supply—Manual, Semi on full magnetic reduced or full voltage control

SQUIRREL CAGE MOTORS

3-Phase — 60 Cycle

Qu.	H.P.	Make	Type	Volts	R.P.M.
1	400	Cont.	NZ-806	2300	1200
1	400	G.E.	I-K	2200	v514
1	400	G.E.	KT-412	2200	450
1	300	Whse.	CS-890	2300	1780
1	200	Whse.	CS-873-C	2200	1200
1	200	Al.Ch.	ARY	440	600
2	125	Al.Ch.	AR	2200	1750
1	125	Al.Ch.	AR	2300	514
1	125	C.W.	126-Q	440	430
2	100	Whse.	CS-663-C	440	1750
1	100	Al.Ch.	AR	550	720
1	100	Whse.	CS-938	2200	514
1	100	F.M.	H-241	440	450
2	75	Al.Ch.	AR	2200	1705
1	78	G.E.	I-K	440	600
1	75	Al.Ch.	AR	2200	720

Special—1 (new) G.E. Vertical KF-574, 2200-Volt 580 R.P.M enclosed, hollow shaft.

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Qu.	KW	Make	RPM	Volts DC	Volts AC
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2	1500	G.E.	600	600	4150/2300
3	1000	Whse.	514	600	11000/6600
4	1000	G.E.	514	600	11000/6600
1	1000	G.E.	514	600	2300
2	600	C.W.	720	575	2300/440
1	400	C.W.	1200	125/250	440/2300
2	250	Whse.	1200	125/250	2300
1	200	Ridgway	900	275	2300
2	200	Whse.	1200	125/250	440
1	155	G.E.	720	250	2300/440
2	150	Whse.	1200	250	2300
1	100	Al. Ch.	1200	125/250	4000/2300
1	100	Delco	1200	125/250	440/220
1	100	Ridgway	1200	275	4000/2300
1	100	C.W.	1200	125	440/220
1	85	C.W.	1200	250	440/220
1	75	Al. Ch	900	250	2300
1	75	Whse.	900	75	2300
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1	25	Al. Ch.	1200	250	440/220

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Qu.	KVA	Make	Type	Phase	Voltage
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1	2750	G.E.	H	3	13,800-2400/4160Y
3	250	Packard	A	1	13,200-2200
3	150	Packard	A	1	2300-230/460
3	100	G.E.	H	1	33,000-2300
3	25	G.E.	H	1	2400-120/240
40(new)	3	Al. Ch.	OISC	1	2400-120/240

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3-Phase — 60 Cycle

Qu.	H.P.	Make	Type	Volts	R.P.M.
1	1800	G.E.	MT 498	2300	357
1	1200	G.E.	MT 26	2200	277
2	1000	Al.Ch.	ANY	2200	235
1	800	G.E.	MT	2200	440
1	700	Whse.	CW	2300	720
1	600	G.E.	MT 20	2300	360
1	500	Al.Ch.	ANY	2200	514
2	500	G.E.	I-16-M	2300	450
1	400	G.E.	MT 412	2200	440
1	250	Whse.	CW 937	440	1200
1	250	Al.Ch.	ANY	440	720
1	250	G.E.	MT 414	2200	300
1	125	Whse.	CW 870	2200	900
1	100	Whse.	CW 766	440	1200
1	100	F.M.	H 20 C	440	900
2	100	G.E.	I-15A-M	2300	514

DIRECT CURRENT MOTORS

Qu.	H.P.	Make	Type	R.P.M.
1***	3000	Whse.	Encl. (Rev.)	600
1***	2400	Whse.	Encl. (Rev.)	600
4***	1500	Whse.	Encl. (Rev.)	600
4***	1200	Whse.	Encl. (Rev.)	600
4***	800	Whse.	Encl. (Rev.)	600
1	350	G.E.	CD-169-A	1150
1	200/250	El. Dy.	No. 22	400/1200
1	250	G.E.	MPC	325/975
1***	200	G.E.	MPC	500/1200
1	200	Whse.	Mill	300/1200
1	180	G.E.	MPC	400
1***	125	Whse.	SK-190	600
2	125	Whse.	SK-184	575/850
1	90/160	G.E.	MPC	625/1125
1	100	Rel.	1050T	400/1200

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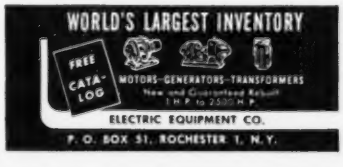

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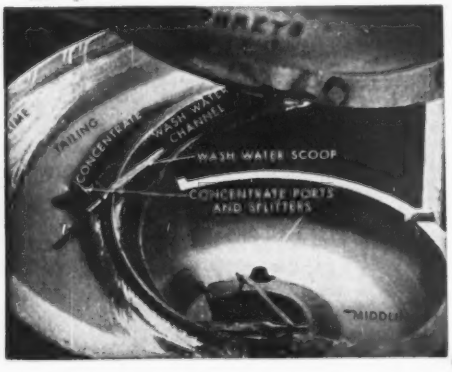

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"Couldn't get along without it"

Floyd Serpa, General Surface Foreman, Mountain Copper Co., Matheson, Calif.

Stockpiling is the main job of this Caterpillar D6 Tractor with No. 6A 'Dozer and D6N Hyster Winch. Among other tasks, it maintains roadways, works on the tramline and, in the winter, keeps 10 miles of blacktop clear of snow, often plowing through 6-foot drifts. Foreman Floyd Serpa, Mountain Copper Co., says: "Our D6 is ideal for our uses. It's handy, easy to transport and able to handle all work. Couldn't get along without it."

This two-fisted rig is shown hefting a 4 to 5 ton load of iron pyrites from stockpile to conveyor cars. Average production over a 75-80 foot haul: 60 tons every 10 minutes. The ore, incidentally, weighs 7,000 lbs. per cu. yd. The D6 with 'Dozer can load out 30 or more 60-ton cars per day. Good going? Yes, and here's another typical D6 performance for Mountain Copper. With Hyster Winch, it does a rope replacement operation along the 4-mile tramway in 4 days, slashing 3 whole days from the 7 the task used to take!

Like all Caterpillar equipment, the D6 is ruggedly built to stay on the job and out of the shop. Its capacity for long life is increased by the use of genuine parts, when needed, and by service from your Caterpillar Dealer. Ask him to show you why it's good business to standardize on big yellow machines. He'll also be glad to demonstrate for you!

CATERPILLAR, Peoria, Illinois

CATERPILLAR

REG. U. S. PAT. OFF.

DIESEL ENGINES
TRACTORS • MOTOR GRADERS
EARTHMOVING EQUIPMENT

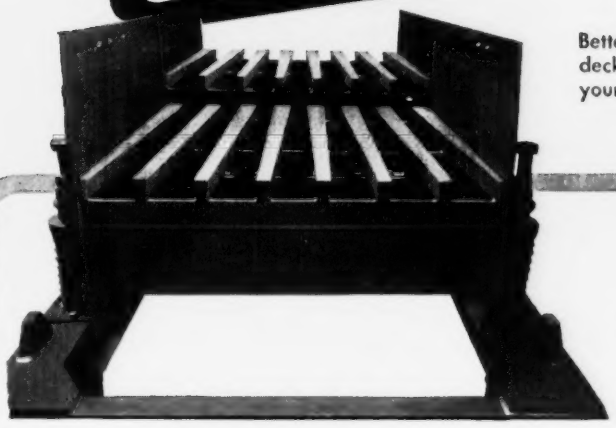
Special Decks for Primary Scalping

ALLIS-CHALMERS
Vibrating SCREENS

Will Give You...

★ **MORE CAPACITY!**
★ **LESS PLUGGING!**
★ **LONGER LIFE!**

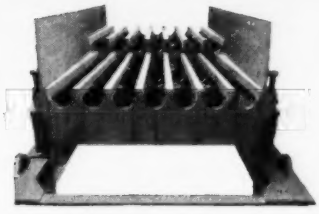
Better results in scalping with these special decks . . . designed to S-T-A-Y C-L-E-A-R on your heavy duty jobs.



Double Tapered Grizzly Bar Deck

(for openings 1 to 3 in.)

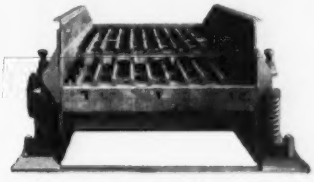
Longitudinal openings between grizzly bars stay clear because bars provide flared openings. Step deck turns material over, dumping fines from large pieces. Each bar is tapered from back to front and from top to bottom for additional freedom from plugging. Handles feed sizes up to 30 in. diameter.



Straight Grizzly Bar Deck

(for openings 4 to 10 in.)

For run-of-mine screen as shown above for use with straight instead of tapered grizzly bars. Openings between bars are flared from back to front for free material discharge. Handles feed in excess of 1000 tph in sizes up to 3 ft.



Steel Plate Deck with Skid Bars

(for openings 3 to 10 in.)

For run-of-mine scalping where positive scalping is desired. Steel plate decks with skid bars may be obtained with or without step deck construction. Plate deck is bolted to screen body and can be removed easily.

These special decks for primary scalping are available on both Style C and Extra Heavy Duty *Ripl-Flo* vibrating screens.

Ripl-Flo is an Allis-Chalmers trademark.

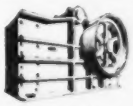
A-3938

ALLIS-CHALMERS

Sales Offices in Principal Cities in the U. S. A. Distributors Throughout the World.

Hammermills

Vibrating Screens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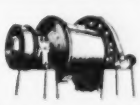
Gyratory Crushers


Grinding Mills

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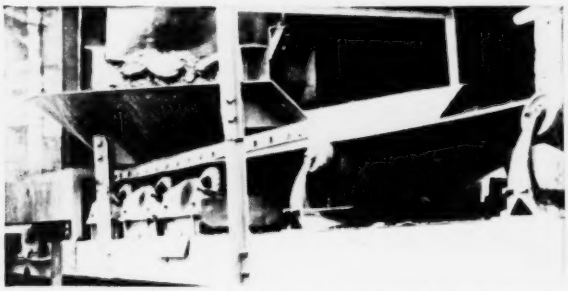
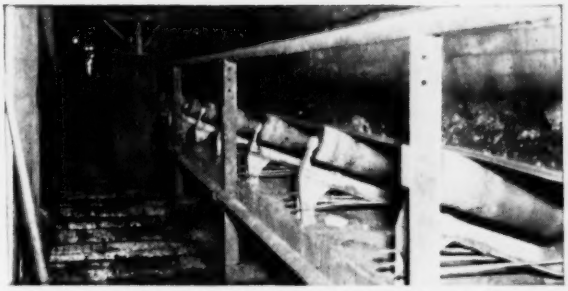
For long-lived, heavy-duty conveyors . . .

IT'S TIMKEN... AND TIMKEN...

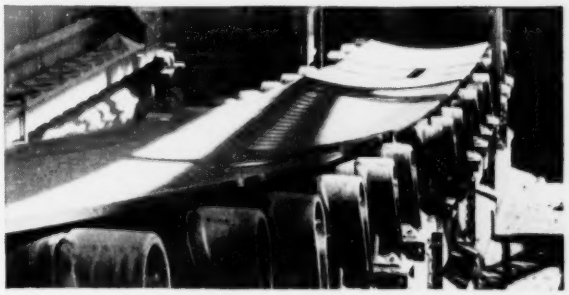


Refuse rock rides 324 feet on this Continental Gin Company conveyor at a mine in Alabama. Rugged Timken bearings in the idlers have given trouble-free service through the years of operation.



Here's a 900-foot Link-Belt Company installation in Pennsylvania, carrying 550 tons of coal per hour to a cleaning plant. Timken bearings reduce friction, assure long idler life, reduce belt wear.

AND TIMKEN AGAIN!



This Timken bearing equipped Stephens-Adamson conveyor in a South American copper mine handled 90-million tons of ore during an 11-year period. Speed is 600 feet per minute. Load is 4800 tons per hour.

AND HERE ARE 6 BIG REASONS WHY:

1 **THOROUGHLY PROVED.** The Timken® bearing is the only tapered roller bearing proved by 15 years or more of service in heavy-duty conveyor installations using the popular dead shaft construction.

2 **EXTRA CAPACITY.** Line contact between rollers and races gives Timken bearings high load capacity. And by using Timken bearing sizes that are mass produced for the automotive industry, you get extra capacity bearings that actually cost *less* than the smaller sizes you'd normally use.

3 **LONG-LIFE LUBRICATION.** Not just lubricated for "life" but lubricated yearly, or as conditions require, to insure *long* life. Fresh lubricant ends any chance of gummy, sticky, jammed bearings.

4 **LONGER ROLLER AND BELT LIFE.** Less sliding and scuffing between idlers and belt.

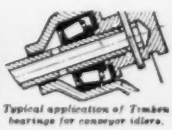
5 **FRICTION MINIMIZED.** Timken bearings' true rolling motion and extremely smooth surface finish practically eliminate friction.

6 **MAINTENANCE REDUCED.** Long life and dependable performance of Timken tapered roller bearings cut maintenance to a minimum.

Remember "Timken" is not a bearing type. It is a trademark applying only to bearings made by The Timken Roller Bearing Company. Always insist on Timken bearings in the conveyors you build or buy. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

Wherever the going's tough industry turns to

TIMKEN
TAPERED ROLLER BEARINGS



Typical application of Timken bearings for conveyor idlers.

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ▯ AND THRUST ◁▯▷ LOADS OR ANY COMBINATION